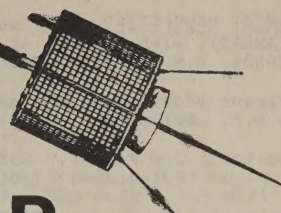


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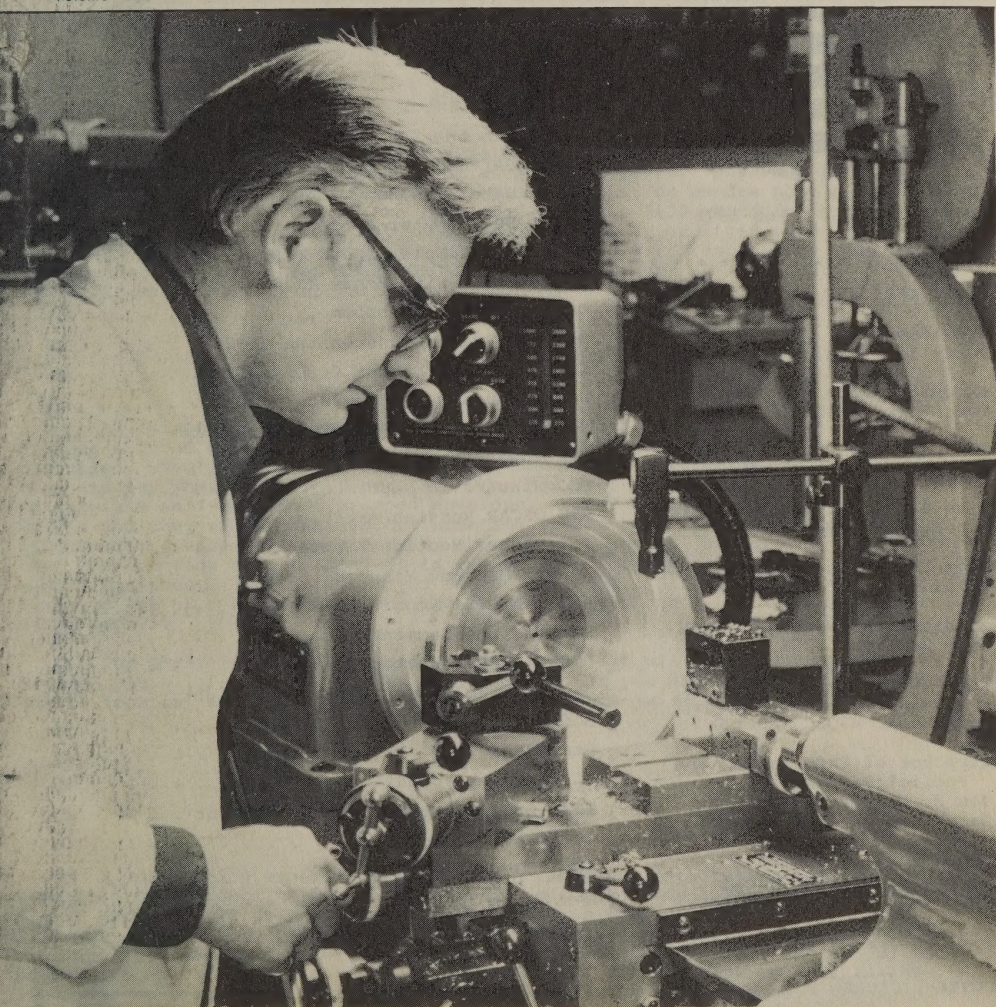
NEWSLETTER

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IMPORTANT! MEMBERSHIP RENEWAL FORM

ENCLOSED

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COVER PICTURE

B. C. (Bert) de Kat
VE3DPB machining the
AMSAT-OSCAR D spacecraft
attach fitting.

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OPERATING SCHEDULE CHANGE

Beginning January 1, 1978, the AMSAT-OSCAR 7 operating schedule will change. The satellite will operate in a three-day schedule of B-B-A. The mode A day will be that Julian day of the year divisible by 3. For example:

Day	1	2	3	4	5	6	7	8	9	10	11...298	299	300...363	364	365
Mode	B	B	A	B	B	A	B	B	A	B	B ... B	B	A ... A	B	B

The schedule change is because, with the expected launch of the AMSAT-OSCAR D spacecraft, and the anticipated launch of the Soviet R-S OSCAR, there will be three working spacecraft in orbit with Mode A transponders.

AMSAT-OSCAR 7

On November 15th AMSAT-OSCAR 7 celebrated its third birthday. On the whole, the spacecraft is in good shape after three years. However, it will only remain in good shape if we, the users, allow it. Let us ensure that our transmitted uplink power is within the recommended levels (100 watts for Modes A and B and 8 to 80 watts for Mode J). Write your actual transmitted power on your QSL card when you verify a contact, not the 500 to 1000 watts capability that you may have available. Let's keep AMSAT-OSCAR 7 up there in use at least until the first Phase III spacecraft is operational.

COMPUTERS

At this time only about 60 cards/letters have come in for the Computer Project and one against. Thus, the amount of coverage in this Newsletter is curtailed. The plan now is to announce items in the Newsletter, briefly outline them and say what state they are in. Then for further information you will have to supply a self-addressed stamped envelope. Several people did enclose such SASE's and they will be mailed out sometime in January. Now, when writing for information, please tell us something about your technical background. Remember that construction of the AMSAT-80 is recommended for clubs or groups who can share test equipment, especially if you reside overseas. If everything works the first time you are ok. Each part tests the other. If you can't get it to work the first time..oops...

The AMSAT-80 is an open-ended money drain; it will never be completed because you will always be adding peripherals. If you want help, information or advice from us, write in (SASE please) or telephone me at home.

BEACON IN THE SKY

A propagation experiment by Stanford Research Institute aboard space satellite P76-5 contains beacons in the amateur UHF bands. The frequencies are 435.97 MHz and 1239.00 MHz. (Note 1239.00 MHz is the image frequency when a 1296 MHz converter is used with a 28 MHz IF). The spacecraft transmits AØ modulation and the beacons are switched off on Sunday evenings (GMT). The 435.97 MHz beacon transmits right circular polarization at a power of 200 mW. It is thus ideal for setting up 435 MHz converters for the AMSAT-OSCAR D Mode J transponder.

The orbital parameters are as follows: Inclination 99.655 degrees, period 105.729 minutes, longitude increment 26.43 degrees, Maximum height 1025.968 km, eccentricity 0.045. The orbit is sun synchronous with equatorial crossing passes repeating at 1117 and 2317 daily LOCAL time.

(Continued on page 43)

THE AMSAT-OSCAR D SPACECRAFT

BY PERRY KLEIN, W3PK, AND
JOE KASSER, G3ZCZ

INTRODUCTION

The AMSAT-OSCAR D, the next AMSAT spacecraft in the OSCAR series, is a Phase II type spacecraft due for launch in March 1978. It was built over the last two years by radio amateurs in the United States, Canada, West Germany, and Japan, and is also the first spacecraft in which AMSAT, Project OSCAR and the ARRL have joined together in building flight hardware.

AMSAT-OSCAR D carries transponders for two modes of operation. There is a conventional 145.9 MHz/29.4 MHz Mode A transponder, and a new 145.9 MHz/435.1 MHz Mode J transponder, a similar frequency combination that was pioneered by the OSCAR IV spacecraft in 1966. Six channels of telemetry are provided to monitor the onboard status of the spacecraft. The spacecraft makes extensive use of parts left over from the AMSAT-OSCAR 7 and Phase III programs.

MISSION OBJECTIVES

The principal objective of the AMSAT-OSCAR D spacecraft is the educational uses of a low orbiting satellite. It is to provide a means for the use of such a satellite as an educational tool in schools or other educational institutions. Other objectives include the continuation of communications demonstrations by means of stations in the amateur-satellite service, of the feasibility of using satellites with small amateur terminals for "bush" communication, emergency communications, communication between medical centers and isolated areas, aeronautical, maritime and land mobile communications, direct satellite-to-home voice "broadcasting" to simple amateur receivers, and other similar applications. Further objectives are to demonstrate special operating techniques that enhance the usefulness of low orbits for these satellite applications, and to test the suitability of a new communications transponder frequency combination (Mode J) for small terminal users.

AMSAT-OSCAR D will permit the continuation of the education program which began with AMSAT-OSCAR 5, 6, and 7, over the next several years, the AMSAT-OSCAR D anticipated lifetime. OSCAR satellites have begun to play an important role in a new approach to science education. Used as remote laboratory tools, these satellites represent a pioneering utilization of an active space system in the classroom. Since the launch of the first satellites twenty years ago, satellites have had a very dramatic impact on education. Using inexpensive ground terminals for OSCAR satellites in schools, students can gain firsthand experience in space science. This type of direct, active involvement has relevance to the study of communications, astronomy, engineering, physics, mathematics and meteorology. The OSCAR ground terminal puts at the disposal of the instructor and student, an active satellite system as a resource for demonstration and experimentation.

SPACECRAFT DESCRIPTION

AMSAT-OSCAR D is a communications satellite in the AMSAT Phase II (low-orbit) series, designed to operate with small stations in the amateur-satellite service on a non-commercial basis. The spacecraft contains two communications transponders and command and telemetry systems. The spacecraft is solar powered, weighs 60 pounds, and is a 15-inch rectangular solid 13 inches high. Its anticipated useful operating lifetime is three years.

Two types of communications transponders are aboard the spacecraft. Normally, only one transponder will be operated at a time because of spacecraft battery constraints.

Two-to-Ten Meter Transponder - "Mode A"

The Mode A transponder is a two-to-ten meter unit similar to the one on AMSAT-OSCAR 7 and with the same frequency passband (input frequency passband of 145.85-145.95 MHz, and output frequency passband between 29.40 and 29.50 MHz). A 250 mW telemetry beacon provides telemetry data in Morse code at a frequency of 29.402 MHz. Approximately -95 dBm is required at the transponder input terminals for an output of one watt. This corresponds to an effective radiated power from the ground of 80 watts for a distance to the satellite of 1,200 miles and a polarization mismatch of 3 dB. The transponder translation frequency (input frequency minus output frequency) is 116.458 MHz. Thus, the relationship between the uplink (f_u) and downlink (f_d) is as follows:

$$f_d = f_u - 116.458 \pm \text{Doppler}$$

where both f_d and f_u are in MHz.

(For example, an uplink signal at 145.900 MHz will produce a downlink signal from the transponder on 29.442 MHz $\pm$ Doppler.) As in the two-to-ten meter transponders in AMSAT-OSCAR 6 and 7, the passband is not inverted, and upper-sideband uplink signals become upper-sideband downlink signals. Output power is 1 to 2 watts.

Note that the downlink frequency will be slightly different (8 KHz) to that of the equivalent AMSAT-OSCAR 7 Mode A transponder that has an equivalent frequency relationship of

$$f_d = f_u - 116.450 \pm \text{Doppler}.$$

Two-Meter-to 70cm Transponder - "Mode J"

The second transponder, constructed by members of the Japan AMSAT Association in Tokyo, uses a two-meter input, 70 centimeter output combination which has not yet been flown in the AMSAT Phase II series. Note that a similar combination was used in the short-lived OSCAR IV spacecraft in 1966.

This transponder, designated Mode J, operates with an input frequency passband of 145.90-146.00 MHz, and an output frequency passband of 435.10-435.20 MHz. Power output is about 1-2 watts PEP, and the output passband is inverted, i.e., upper-sideband uplink signals become lower-sideband downlink signals. The transponder translation frequency (input frequency plus output frequency) is 581.1 MHz $\pm$ Doppler. Uplink sensitivity for one watt output is -105 dBm, corresponding to an eirp from the ground of 8* watts for a distance to the satellite of 1200 miles. Note the greatly improved sensitivity of this mode, and keep your power down. A 100 milliwatt beacon carries telemetry at a frequency of 435.095 MHz.

The relationship between the uplink (f_u) and downlink (f_d) is as follows:

$$f_d = 581.1 \text{ MHz} - f_u \pm \text{Doppler}$$

where both f_d and f_u are in MHz.

Antenna System

Both the Mode A and Mode J transponders use the same receiving antenna, a canted turnstile comprised of four 19-inch lengths of 1/2-inch carpenter's rule fed by a hybrid and matching network so as to develop circular polarization. One port of the hybrid feeds the Mode A receiver such that left-hand circular polarization is required by users in the Northern Hemisphere, and right-hand circular polari-

*Sensitivity may decrease by a factor of 10 (10 dB) under different conditions of battery voltage and satellite operating temperature, so that at certain times as much as 80 watts may be required.

zation in the Southern Hemisphere. A second port of the hybrid is connected to the Mode J receiver such that right-hand circular polarization is required in the Northern Hemisphere, and left-hand circular polarization in the Southern Hemisphere. The antenna gain should approach 5 dB in the -Z direction (i.e., toward the bottom of the satellite.)

The Mode A ten-meter downlink antenna is a linearly-polarized dipole, oriented perpendicular to the stabilization magnets in the spacecraft as in AMSAT-OSCAR 6 (but unlike AMSAT-OSCAR 7, which has the ten-meter antenna parallel to the axis of the magnets).

The Mode J 435 MHz downlink antenna is a simple monopole, linearly polarized, and located on the top of the spacecraft. Note that its location may result in some radiation shielding at high Southern Hemisphere latitudes.

Telecommand System

A five-function telecommand system of a new design is carried on AMSAT-OSCAR D. The system is based on the best features of the AMSAT-OSCAR 6 and 7 telecommand systems, and is designed to be virtually immune from noise and interference. The command functions are:

Mode "A" Select (Two-to-ten meter transponder ON)
Mode "J" Select (2M-to-70cm transponder ON)
Mode "D" Select (Recharge mode; both transponders OFF)
Ten-meter Antenna Deployment
Ten-meter Antenna Reset

Telemetry System

AMSAT-OSCAR D contains a six-channel Morse code telemetry system similar to the units flown in AMSAT-OSCARs 6 and 7. Telemetry is sent at 20 words per minute as three-digit numbers in Morse code. A1 emission is used in keying the Mode A or Mode J telemetry beacons, depending upon which transponder is in use. The six telemetry parameters are:

Ch.1 - Total Solar Array Current	$I_T = 7.15(101-N) \text{ ma.}$
Ch.2 - Battery Charge-Discharge Current	$I_{\text{Bat}} = 57(N-50) \text{ ma.}$
Ch.3 - Battery Voltage	$V_B = 0.1 N + 8.25 \text{ volts}$
Ch.4 - Baseplate Temperature	$T_{bp} = 95.8 - 1.48 N (^{\circ}\text{C})$
Ch.5 - Battery Temperature	$T_{\text{Bat}} = 95.8 - 1.48 N (^{\circ}\text{C})$
Ch.6 - RF Power Out. - <u>Mode J</u>	$P_{JT} = 23N \text{ milliwatts}$

A sample telemetry frame would be: 120 255 380 451
551 620 HI 120

Note that, unlike AMSAT-OSCAR 6 and 7 telemetry, AMSAT-OSCAR D has only one parameter per line (AMSAT-OSCAR 6 and AMSAT-OSCAR 7 had 4). As a result, a complete telemetry frame is sent in approximately 20 seconds.

Power System

The spacecraft contains solar panels on its four sides (along the +X, -X, +Y and -Y axes), and on the top (the +Z axis). No panels are contained on the bottom (-Z axis), since this is where the spacecraft attaches to the launch vehicle.

The solar cells, combined with a 12-cell, six-ampere-hour rechargeable nickel-cadmium battery should be adequate to power the spacecraft with a positive power budget in Mode A for several years even considering solar cell degradation in the radiation environment. The power drain in Mode J, however, is somewhat larger, and so the Mode J transponder probably cannot be operated continuously.

A battery charge regulator is also contained which converts from the 28-30 volt solar array voltage to the 14-16 volts required by the battery. It also tapers the charge rate so that the battery trickle-charges as the battery approaches full charge (as indicated by the battery voltage).

Stabilization System

Four permanent magnets located inside the spacecraft and aligned along the Z axis provide stabilization, as in AMSAT-OSCARs 6 and 7. The polarity of the magnets is such that the top (+Z axis) of the spacecraft always points toward the magnetic North Pole of the earth. Hysteresis permalloy damping rods mounted behind the +X, -X, +Y and -Y solar panels are designed to reduce the spin of the spacecraft about the Z axis, functioning in a manner similar to a shorted transformer turn as it cuts the lines of flux of the earth's magnetic field. The permalloy rods are leftover from AMSAT-OSCAR 7, which successfully used the same type of stabilization system.

LAUNCH INTERFACE AND ORBIT

The AMSAT-OSCAR D spacecraft is being launched from the NASA Western Test Range as a secondary ("piggyback") payload with the NASA LANDSAT-C earth resources technology satellite and the NASA PIX (Plasma Interaction Experiment). The spacecraft will be ejected from the second stage of the two-stage Thor-Delta 2910 launch vehicle 5120.6 seconds after liftoff, at an approximate position of 78 degrees N. latitude and 15 degrees W. longitude. Programmed orbital parameters are:

Apogee : 577 statute miles
Perigee : 549 statute miles
Period : 103 minutes
Inclin.: 99.0 degrees
Time of Descending Node: 9:30 AM
(launch window from 9:54-10:24 AM)

The orbit is planned to be sun-synchronous, with passes repeating at the same time each day on a one-day cycle (as opposed to the two-day cycle of AMSAT-OSCAR 6 and 7).

SPACECRAFT INITIALIZATION PROCEDURE

AMSAT-OSCAR D will automatically be powered up upon ejection from the Thor-Delta launch vehicle over Northern Greenland at which time it will assume the next available number in the OSCAR series. It is designed to initialize itself in Mode J (two-meter-to-seventy-centimeter transponder ON). The two-to-ten meter (Mode A) transponder will be initialized OFF and should be kept off until the spacecraft is nearly completely stabilized, which may require a period of as much as a week. Because of the non-rigidity of the deployable ten-meter dipole antenna, this antenna must not be deployed until the spacecraft spin rate is less than 1 rpm; otherwise, the antenna may be severely damaged or may not deploy properly. AMSAT-OSCAR D's ten-meter antenna is comprised of tubular extendable members which are unreeled slowly from the spacecraft by small motors. The deployment process takes approximately 15 seconds and is non-reversible (i.e., the antenna elements cannot be retracted once they are deployed). During the time when the antenna is being deployed, the telemetry beacon switches from its normal Morse code format to a series of keying pulses, the rate of which is a function of the tip-to-tip length of the ten-meter dipole, and the rate-of-change of which indicates the rate of deployment. The telemetry tone should be carefully tape-recorded during deployment of the antenna to permit analysis later to verify success.

Telecommand Verification Procedures

AMSAT-OSCAR D's telecommand and telemetry systems have been designed to provide two means to easily verify whether the spacecraft is accepting commands. First, when the telecommand system has been enabled and is ready to accept a command, the Morse code telemetry will be interrupted, and an unmodulated carrier will be heard on the beacon frequency. The beacon will revert back to Morse code telemetry when the telecommand system is no longer enabled.

The second method of telecommand verification is to use the "Ten-meter Antenna Deployment" command. This will cause a series of keying pulses to be heard on the telemetry beacon in place of the Morse code telemetry if the command has been accepted. The "Ten-meter Antenna Reset" command should be sent soon afterward in order to restore the beacon to the Morse code telemetry mode. (WARNING to telecommand station operators: Do not use this second method of command verification until positive confirmation by AMSAT that the ten-meter antenna has been deployed.)

Telemetry Interpretation

The most important telemetry channel that will affect operations decisions is channel 3 (battery voltage). In Mode A the spacecraft should maintain a positive power budget so that there should not be a net discharge of the battery over an orbit average. Mode J operation, however, requires somewhat more power, which may result in a net discharge of the battery, especially under conditions of high transponder loading, and therefore it will be necessary for telemetry and telecommand stations to keep a close watch on the battery voltage so that action can be taken as necessary to command the spacecraft into Mode D (the recharge mode) before the battery discharges too far. Three cutoff levels are specified below:

Red Level "A":	(1.2 volts/cell)	Ch. 3 = 61 counts
Red Level "B":	(1.1 volts/cell)	Ch. 3 = 50 counts
Red Level "C":	(1.0 volts/cell)	Ch. 3 = 38 counts

Red Level "A" should be used during the first year or so of the spacecraft's life as the cutoff point below which telecommand stations should command the satellite into Mode D for recharging. Later in the spacecraft's life as the battery discharge characteristic curve changes, Red Level "B" should be used, and Red Level "C" should be used if there is evidence of deterioration of the battery, or if it is desired to recondition the battery.

Channel 1 (solar array current) provides an indication of whether the spacecraft is in the sun or eclipse (it should read in the nineties in counts when in eclipse.) Fluctuation in ch. 1 telemetry is the best indicator of the rate of spin of the spacecraft, along with observations of fading, particularly of the 435 MHz Mode J downlink signal from the quarter-wave 435 MHz monopole antenna.

Channel 2 (battery charge-discharge current) gives information on whether the battery is charging or discharging. A reading larger than 50 counts indicates that the battery is charging, while a reading of less than 50 counts means the battery is discharging. There is a two-second integration time associated with the current telemetered on this channel. The total power drain of the spacecraft can be determined by observing channel 2 while the spacecraft is in darkness (as indicated by channel 1, which should read in the nineties in darkness).

Telemetry channels 4 and 5 (baseplate temperature and battery temperature) should generally track within a few degrees (except perhaps in the first day or so after launch when the spacecraft has not yet stabilized at thermal equilibrium.) Experience from AMSAT-OSCARS 6 and 7 indicate that the battery can overcharge and overheat during periods of the year when the spacecraft sees the most sunlight. If this is the case, channel 5 may exceed channel 4 in temperature by 10 degrees or more (Centigrade), and action should be taken to reduce this overheating. This can be accomplished by keeping the spacecraft in Mode J to consume any extra charge current from the battery.

Channel 6 is a measure of the Mode J transponder 435 MHz RF power output. Associated with the telemetered readings is an integration time of 2.5 seconds, so that it is average power rather than peak power that is telemetered. There is no telemetry of the Mode A transponder. The Mode A transponder power consumption (largely determined by the PA current) can be measured by observing channel 2 telemetry as noted above.

OPERATING SCHEDULE

Since the prime mission of the AMSAT-OSCAR D spacecraft is to use the Mode A transponder for the ARRL OSCAR educational program in schools, the spacecraft may be left in Mode A during weekdays (Mondays through Fridays, U.S.A. time), and put in Mode J on weekends. Note that all communications should conform to the G3ZCZ band plan. Additionally, if not an excessive burden on the telecommand stations, evening orbits in the Western Hemisphere (morning orbits in the Eastern Hemisphere) can be switched to Mode J, battery permitting. In any case, all operation in Mode J will require careful monitoring of the battery charge level (as indicated from channel 3 telemetry, battery voltage). The power budget may not support the Mode J transponder for fulltime, continuous operation in this mode over an entire weekend.

In any event details of the operational modes of the spacecraft will be announced by AMSAT in the Newsletter, and late updates on the AMSAT Nets.

AMSAT-OSCAR D will operate in a 560 statute mile orbit, i.e., at just over half the altitude of the 910 statute mile orbit of AMSAT-OSCAR 7. Thus, communication ranges will be different. The usable time on an overhead pass will be about 18 minutes instead of the 22 minutes provided by AMSAT-OSCAR 7 and the horizon range will be 2000 miles instead of the 2450 miles of AMSAT-OSCAR 7. This means, for example, that trans-Atlantic communications will still be possible but not as often as with AMSAT-OSCAR 7.

Keeping track of this satellite is going to be much simpler than for AMSAT-OSCAR 7. It will come into range at the same time each day (more or less); the overhead descending node pass is planned for 9:30 A.M. local time.

CREDITS

AMSAT-OSCAR D as a spacecraft was built primarily because the Phase III spacecraft would not be available until 1979. By stretching its resources almost to the limit, AMSAT has been able to work on both the Phase III spacecraft (with lots of publicity) and AMSAT-OSCAR D (with hardly any). It is impossible to single out for mention all those who contributed to the construction of the spacecraft, but a few calls can be listed as follows:

JAMSAT - Mode J Transponder

JALANG, JALCBL, JG1CDM, JALVDV, JALJHF, JRLSWB

AMSAT - Mode A Transponder

WA4DGU, W3PK

Morse Code Telemetry System

W5CAY, WA4DGU

Telecommand System

W3GEY, WA3LND, WA3ZCE, W3HUC, W3ITO, K1RT/WALJZC

Antenna and Antenna Deployment Module

W3GEY, W3HUC, W3ITO, K1RT, WA3LND

Power System

DJ4ZC, JA1TUR, JF1DMQ, K1RT, W3HQ

Structure and Module Containers

K6GSJ and Project OSCAR, K1JX/WA1JLD, K1RT, WA4DGU, VE3DPB, W3ZKI,
W3HSO, WBØGIM, Henry Smith, David Vanderbeke

Cables and Wiring

Marie Marr

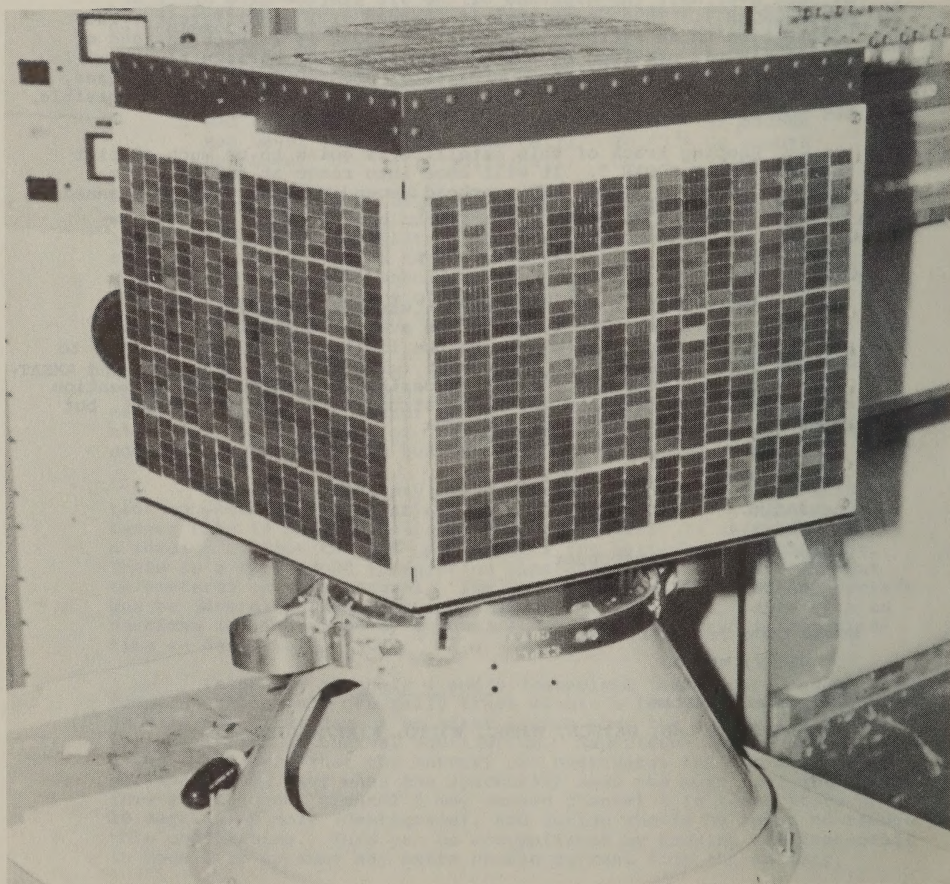
Engineering Drafting

WB4GIB

To others who contributed or assisted, our thanks and the thanks of thousands of radio amateurs, school children and educators are due to you.

Let us use the satellite wisely so that it may help further the educational program until the Phase III satellites are flying high.

AMSAT-OSCAR D SPACECRAFT

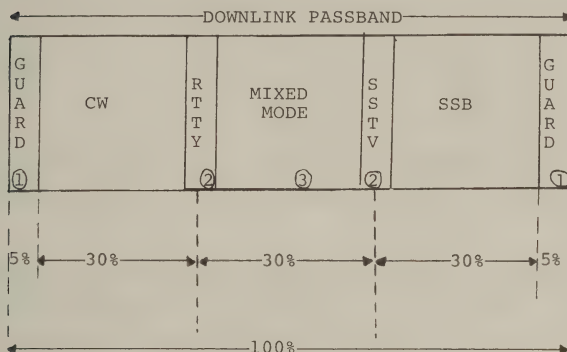


THE G3ZCZ SATELLITE BAND PLAN

This band plan proposed in the September 1977 issue of the AMSAT Newsletter has been adopted by the AMSAT Board of Directors as the recommended operational usage of the AMSAT-OSCAR communications transponders. This conforms to the normal downlink usage of the AMSAT-OSCAR 7 satellite over Europe.

This plan allocates a percentage of the available radio frequency spectrum as seen on the downlink to different modes of communication. The relative amount of spectrum for each mode is thus the same for any transponder in any satellite.

The allocations are as follows:



- Notes:
- ① Guard Area to avoid interference to beacons. These frequencies are available for Emergency and Bulletin Stations.
 - ② RTTY and SSTV are placed at the edge of the CW and SSB passbands, conforming to their usage at HF where RTTY is present within the CW space and SSTV is transmitted in the SSB subband.
 - ③ Mixed Mode Area. This is recommended for crystal controlled stations, or by Dx-pedition stations, or anyone wishing to work both CW and SSB stations.

This band plan is always based on percentages of the downlink passband. It applies to both inverting and non-inverting transponders. The allocations of frequency for AMSAT-OSCARS 7 and D are as follows.

DOWNLINK PASSBAND								
LF	GUARD	CW	RTTY	MIXED MODE	SSTV	SSB	GUARD	HF
MODE A	29.4		29.435		29.465		29.5 MHz	Guard Channels 5 kHz
MODE B	145.925		145.94		145.96		145.975 MHz	Guard Channels 2.5 kHz
MODE J	435.1		435.135		435.165		435.2 MHz	Guard Channels 5 kHz

THE AMSAT-80 COMPUTER PROJECT

BY JOE KASSER, G3ZCZ

PART II -- Assembling the Computer

The computer can be assembled in a logical order so that at each stage, the previously built sections can be used to test the new section just completed. Since new S-100 cards are constantly being announced, and the price of the hardware is also, in the main, dropping, it is advisable to purchase only as much hardware as you will require for the next stage.

The first thing to do is to build the power supply and cabinet. The power supply must have the following characters for output capability.

+8 to +10V at 10-20 Amps
+16 to +18V at 2 Amps
-16 to -18V at 2 Amps

Since all S-100 cards have onboard voltage regulation, the main power supply voltages do not need to be regulated.

The Cabinet

This should be a box big enough to contain the motherboard (and power supply if you intend to put it in the box). The minimum quantity of switches are "reset, (power on/off) and boot". If you plan to do a lot of I/O operation, common in amateur radio applications, a front panel input and output port would be advisable. Software can be written to sense the switches and output to the display depending on the state of itself. The motherboard should be installed in the cabinet. If you do not plan to fill it up with cards, space the connectors when you do solder them to the motherboard. Take care in the construction of your cabinet. No matter how many switches or lights it contains, it is the part that all visitors will view and thus should truly reflect the best of your workmanship.

The Logical Card Building Sequence

The Cards should be assembled in a logical order such that results may be obtained from each, giving a level of confidence to the builder. A suggested order is as follows:

1. Front Panel Interface
2. Video Display or I/O
3. Memory (one ram/rom at this time)
4. CPU
5. Remaining Memory
6. Cassette I/O
7. Any remaining

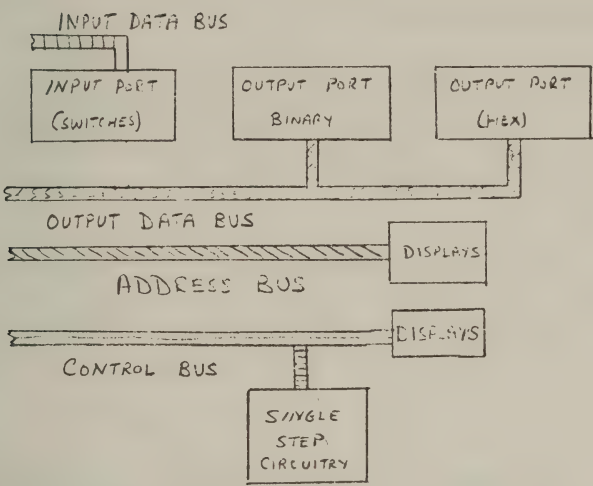
If you don't build a hardware test facility (or the full front panel), get your cards tested by a friend in his machine. There is nothing more frustrating than owning a system in which a lot of dollars have been sunk and have it do nothing and not be able to troubleshoot it.

Front Panel Interface Card

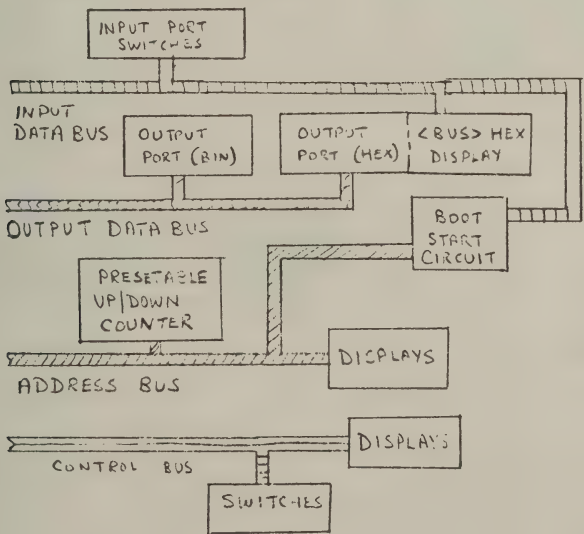
This card is built on a Vector Wire Wrap Card. It contains hardware circuitry to single step the microprocessor, generate the MEMW signal, Boot start to AMS-80 on turn-on, and display the contents of the address and data busses on a front panel. By putting the CPU in the hold state, the front panel can be used to examine and change the contents of memory locations and I/O ports. A pre-settable up-down counter is used to address the memory. Buffering is provided for the following control bus signals so as to enable their display on the front panel: IOW - IOR MEMW MEMR STK WAIT HOLD HLTA and INTE. Decoding is provided for two output and one input ports.

The prototype front panel, shown in the photos, contains one input port (binary switches) and two output ports, [one in binary (8 LED's) and one in hex]. The address and data bus displays can be hex, octal or binary. Hex or octal are recommended.

A block diagram of one card is shown below. Schematics exist but no other documentation exists at this time.



(a) "RUN" MODE



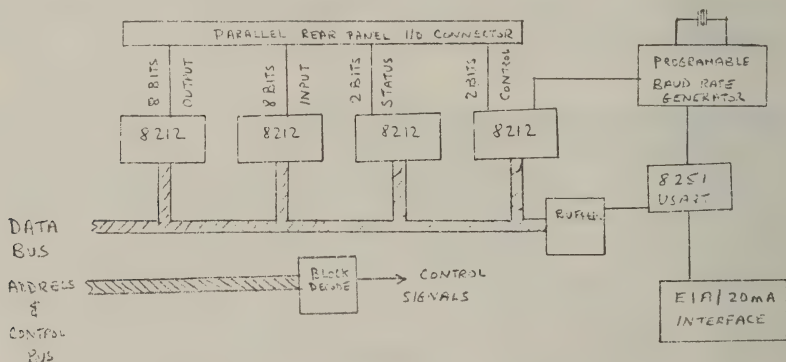
(b) "PANEL" MODE

Amateur Radio Card -- 1

The ARC-1 is built on an IO-2 card. It contains the following I/O circuitry:

- | | |
|------------------------------------|----------------------|
| 1 input port (8 bit parallel) | - TTL Level |
| 1 output port (8 bit parallel) | - TTL Level |
| 2 control bits (one to each port) | - TTL Level |
| 2 status bits (one from each port) | - TTL Level |
| 1 programmable serial port | - RS-232/20mA levels |
| 1 programmable baud rate generator | |

The parallel port circuitry uses 8212's and the serial port uses an 8251 USART. The serial port is thus programmable for asynchronous (RTTY) 5 or 8 level signals. The serial input line is also available separately for Morse Code decoder software. The programmable baud rate generator uses a 4.509 MHz crystal (so as to be bus clock independent) and provides the following baud rates under software control 45.5, 50, 56.8, 74.2, 75, and 110 bauds. At present schematics but no write-up exist. A block diagram of the card circuitry is given below.



Group Purchase Plan Update

VB-1 Video Display Board - Price reduced to \$110.00
IO-4 I/O Board, New - 2 serial ports multibaud rates \$110.00
2 pair parallel ports
New Memory Board - See page 3 of December KILOBAUD for specs.
Wired, tested, and burned-in. Uses TI TMS-4044
4K x 1 static memory chips.
32K - \$680.00 16K - \$400.00
24K - \$540.00 8K - \$160.00

Control Card -- 1

The Control Card is built on an IO-2 card. It contains the following circuitry:

- Front Panel Status Lights Drivers
- Sense switch input port
- 2 Input ports (8 bits each)
- 1 Output port (8 bits)
- Boot Start Circuitry
- MEMW Generator
- VB-1 Hardware accessories
- Run/ Stop Flip-Flop

The VB-1 hardware accessories include scrolling rate, cursor blinker, bell circuit. The I/O ports will support a keyboard, bell, control and status lines, etc. Schematics only exist at this time.

Antenna Az-El Control Card

WLHDX has developed an S-100 Antenna Control Card on wire wrap with the following specifications:

- 3-1/2 digit A/D Converter
- 8 channel Analog Multiplexer
- 4 Relay Lines (Up, down, left, right)
- Spare I/O port for station control

The price of a pc kit version of this card would be under \$100.00. We need to know if you are interested in such a card so as to decide if making a pc layout is worthwhile. If you would like such a card, please send a QSL/post card to G3ZCZ now.

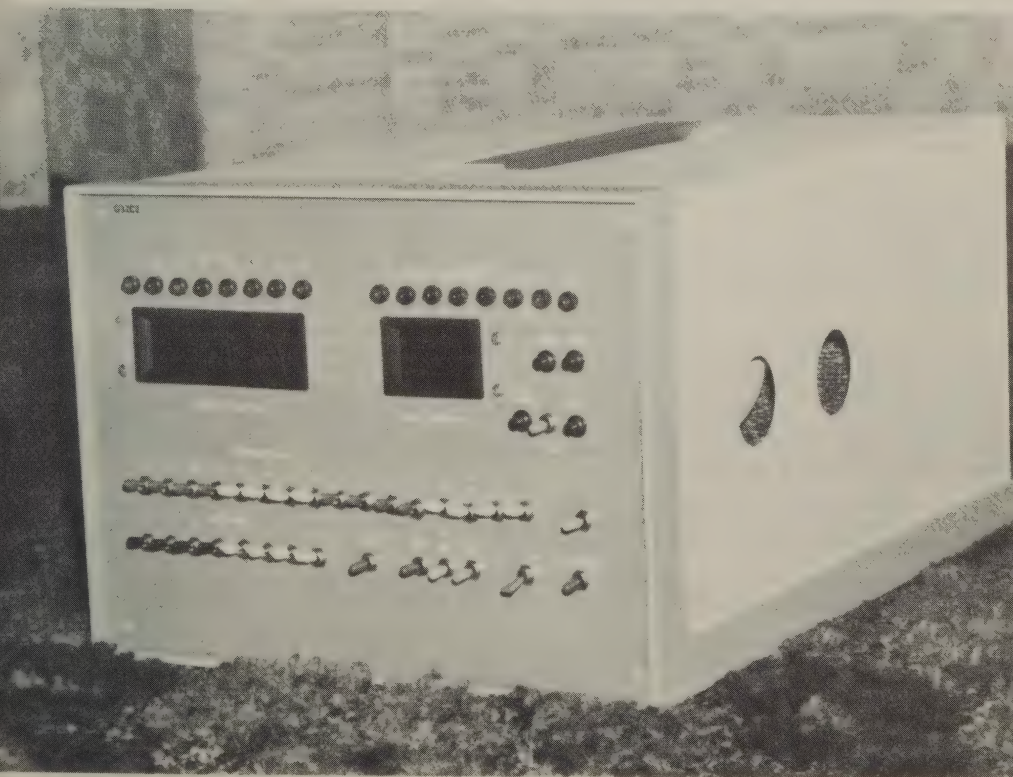
Answers to Questions

This section is in lieu of individual replies in order to save time.

The AMSAT-80 can be a stand alone machine. It is designed as a modular system of hardware and software. The software is mostly hardware independent and can run on any 8080/Z-80 machine. The only hardware dependent software written at this time is the VB-1 driver routines.

The AMSAT-80 as a construction project is designed as a group project. If you don't have adequate experience and test facilities, think twice about building it. If you have an 8080 system and have applications software that you'd like to share, let us know. It will save us re-inventing it. We now need an interrupt driven Morse Code to ascii conversion routine (paper tape source code) or 100 baud audio cassette recorded with RTTY tones 170 shift.

AMSAT-80 COMPUTER PROJECT PROTOTYPE



OSCAR FOR SIMPLE MINDED BASICS

BY DAVE JONES, WAZAML

When I became involved with the world of Microcomputers about eighteen months ago, I had no idea that they would be able to play such a great part in my Amateur Radio activities. I have since used the computer for many Ham related activities: everything from keeping maintenance records, to logging. I can not only use it to log each QSO, but can use it to copy the log. This has proven very handy for contesting. Not only these chores are being done by my Southwest Technical Products 6800 machine. I am also able to send and receive high speed Morse code, displayed in video, of course, with the system. This feature, coupled with the log program, and a simple monitoring system, will allow me to try to be the first to achieve DXCC without making a single transmission myself.

However, this is not the topic of this article. The real purpose herein is to present a highly accurate, and very reliable OSCAR Prediction program, capable of being used on systems with small memories, simple basic languages, and even on programmable or hand calculators. Being designed for use with simple basics, the program allows for the use of fixed point arithmetic operations, yet it provides 4 digit accuracy in the figured EQX longitudes. Not only this, but you can forever after put away your OSCARLOCATOR, as the program also will tell you if the orbit can be accessed from your QTH!!

Run with a day to day reference orbit information update, the program is flawless. Checking the results of the calculations over a full year of orbits, the error is small, but significant. The error is caused by the fact that the satellite orbit is slowly changing. The figures that are provided to the ARRL for broadcast over WIAW, are regularly corrected by AMSAT to compensate for these changes, but, even with this factor not accounted for in the program, the use of daily reference figure updates, which are readily available, will give the user very accurate predictions.

Now, into the meat of the program. As with any calculative program, the user inputs are called for first. These appear from lines 60 to 150 of the program. The lines preceding this can be eliminated to save memory, as they play no part in the function of the program.

Starting at line 200, the parameters have been set, and the program begins calculating the desired information. Line 200 sets the orbit counter to the difference between the number of the reference orbit, and the target orbit. This counter is used to stop the program, when the desired number of orbits have been completed.

The times, in seconds, minutes, and hours are calculated from line 250 to line 265, inclusive. The seconds are calculated first, and if the number of seconds is greater than 59, the minute counter is incremented by one. The program then checks to see that the number of seconds is not still greater than 59, and if it is, the process repeats itself until there are 59 or less seconds, incrementing the minute timer each time there are more than 59 seconds showing on the counter. The number 59 was used, as the 60th second of each minute is zero.

The minute calculations are accomplished in the same fashion, with the exception that the hours are incremented. The hours clock in the program was set for a 24 hour clock, and when the hours go beyond the 23rd hour, the program increments the day counter (date) by one. No provision has been made in the program to change the month counter or the year counter, so it is possible for the program to give us a 32nd day in December, and not change the year. These provisions could be easily added, but they would force the program to occupy more than the less than four K that it presently does.

Lines 300 to 387 calculate the EQX longitudes for each of the successive orbits. Line 389 increments the orbit counter to see if the calculations are finished. Line 390 will end the program when all of the calculations are complete.

Lines 395 to 550 print out the orbital reports. The addition of the following statement will provide a delay for each frame that the program prints.

```
Line 555 LET V = 750
      560 LET V = V-1
      565 IF V > 0, THEN GO TO 560.
```

Line 550 sends the program to the subroutine that is used to determine if the satellite should be accessible from a QTH. The numbers used in lines 2002

to 2006 should hold fairly accurate for anyone living in Southern New Jersey, but if you're elsewhere in the country, you'll need a SATELLABE to determine the figures that you should use. I will now explain how to get the figures from the SATELLABE.

The figure 110, used in line 2002, was derived from the westernmost point that intersects the RANGE circle centered on my QTH. This was found by placing the satellite arc in such a manner that the westernmost intersection was displayed, and then the longitude was read from the equator circle.

The figure 210 used in line 2003 was similarly found, but this time, the westernmost descending node point was established.

In line 2004, the number 319 represents the westernmost intersection for descending node orbits.

Three-hundred thirty-nine in line 2005 represents the point at which the orbit begins intersection of the range circle on the late afternoon passes.

Two-thousand six is the last determining line, and the number 340 is the point where the orbits again begin to intersect the range circle.

REMEMBER when using this function, that certain passes indicated as accessible by this system are marginal AT BEST. This is because the figures represent the extreme reception edges, to allow the user the possibility of experimenting with band conditions, antennas, and any other trick one might try to use to get a few more receptions per week from the satellite.

That's it, it works, and if enough interest is shown in the use of computers and amateur radio, perhaps I'll sit down and type out the text of some other OSCAR programs I have, like one for decoding the telemetry, or for controlling the azimuth and elevation of the beams I use for OSCAR.

```
10 PRINT"OSCAR ORBITS FOR SIMPLE MINDED BASICS"
20 PRINT"WRITTEN BY DAVE JONES, WA2AML"
30 PRINT"REV.1.5 C 1977"
60 PRINT"INPUT DATE OF REFERENCE ORBIT"
70 INPUT D,E,F
80 PRINT"INPUT THE REFERENCE ORBIT NUMBER"
90 INPUT R
100 PRINT"INPUT THE LONGITUDE OF THE EQX IN DEGREES AND TENTHS"
110 INPUT L,G
120 PRINT"INPUT THE TARGET ORBIT NUMBER"
130 INPUT J
140 PRINT"INPUT THE TIME OF THE REFERENCE ORBIT IN HRS, MIN, & SEC."
150 INPUT H,B,C
200 LET K=J+1-R
201 LET O=R
250 IF K>0 LET C=C+58
251 IF K>0 LET B=B+114
252 IF C>59 LET B=B+1
253 IF C>59 LET C=C-60
254 IF C>59 GOTO 252
255 IF B>59 LET H=H+1
256 IF B>59 LET B=B-60
257 IF B>59 GOTO 255
260 IF H>23 LET E=E+1
265 IF H>23 LET H=H-24
300 IF K>0 LET L=L+28
350 IF K>0 LET C=G+7362
360 IF G>9999 LET L=L+1
370 IF G>9999 LET C=G-10000
380 IF G>9999 GOTO 360
385 IF L>360 LET L=L-360
387 IF L>360 GOTO 385
389 LET K=K-1
390 IF K=0 GOTO 3000
395 LET O=O+1
510 PRINT"OSCAR REPORT FOR ORBIT NR.";O
520 PRINT"DATE";D,E,F
530 PRINT"TIME OF CROSSING";H;"HRS";B;"MIN";C;"SEC"
540 PRINT"LONGITUDE OF CROSSING";L;".";"G;"DEGREES"
550 GOSUB 2000
900 IF K=0 GOTO 3000
```

EXPERIMENTS WITH PHASE II SATELLITES

BY PERRY KLEIN, W3PK

FROM THE
PRESIDENT'S DESK...

Although AMSAT-OSCAR 6 operations have passed into history, AMSAT-OSCAR 7 entered its fourth year of operation in November. AMSAT-OSCAR D is scheduled for launch now in March 1978 and the Soviet RS-OSCAR series has been announced. Thus, 1978 should be a bumper year for radio amateur space communications with three active operational spacecraft in orbit.

These Phase II satellites are forerunners of an operational amateur radio space service in the sense that the orbital passes are short (18-22 minutes maximum) but they have demonstrated the potential of the Amateur-satellite Service, a resource that will be fully realized with the launch of the first Phase III spacecraft in 1979.

The potential for the uses of the Phase II spacecraft are described below. They are many and varied. Some have been demonstrated systematically, some have not. If you are interested in active AMSAT operations, why not use your equipment to perform or carry out some of these experiments.

- Small-terminal "Bush" Communication Tests

"Bush" or "out-back" communication of a non-amateur variety, such as might be found in Alaska, northern Canada, Australia, Antarctica or the developing countries, is analogous in many respects to amateur communication anywhere in the world. Many amateurs regularly use small portable HF and VHF transmitters and receivers, equipment installed in automobiles, and hand-held equipment. The Phase II spacecraft are designed to provide long-distance VHF communication at distances up to 2,000 miles, especially needed at night or during other times when long-distance ionospheric communications at HF are difficult.

- Emergency Communications

Radio amateurs have, on numerous occasions, provided the only source of communications in time of emergency. The 1970 earthquake in Peru and 1972 earthquake in Managua are but two examples. Indeed, in setting forth the basis and purpose of the amateur service, the U. S. Federal Communications Commission cites "...the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications." It is expected that Phase II spacecraft can be used in support of such communications during any such emergencies, as a backup for HF radio, which is highly dependent upon favorable ionospheric conditions.

- Medical Data Communications

Many cases have been documented in which amateur communications were used to locate needed drugs, diagnose a rare disease, or give medical instructions during surgery. Phase II spacecraft are capable of relaying such communications, and in addition, tests will be continued between medical centers and hospitals in isolated areas to exchange medical data using the satellites to relay this information. The National Institutes of Health Radio Amateur Club in Bethesda, Md. has already been involved with the University of Arizona Medical Center in this aspect of the amateur satellite program.

- Mobile Terminal Communication

AMSAT-OSCARs 7 and D employ circularly polarized uplink antennas so that the spacecraft can potentially provide further useful data on satellite signal propagation to mobile terminals. Aircraft, ship and automobile amateur terminals will be installed to provide further information on the feasibility of using VHF/UHF satellite mobile terminals over all possible satellite elevation angles and with several types of modulation.

- Direct Satellite-to-Home Voice Broadcasts

The transmitter power output of Phase II satellites are expected to be sufficient so as to permit useful reception with ordinary amateur receivers using

low-gain receiving antennas. Transmissions using the satellite transponders, such as those conducted at the Technical University of Budapest, will demonstrate the potential of using satellites for satellite-to-home voice broadcasting directly to conventional, inexpensive receivers. In addition, it is anticipated that satellite experience will lead to the development by amateurs of increasingly simple ground equipment for these applications. Amateurs have a history for devising innovative methods for producing simple equipment at low cost.

SUGGESTED EXPERIMENTS

Listed below are suggested experiments as a guide to what can be done with the transponder and telemetry systems aboard Phase II OSCAR satellites.

- Educational demonstrations in schools.
- Ranging (distance-measurement) experiments to determine satellite or user position.
- Doppler (range-rate) measurements to determine satellite or user position.
- Emergency Locator Transmitter (ELT) experiments to locate downed aircraft or ships in distress.
- Small-terminal user experiments using hand-held equipment, or mobile terminals operated from an automobile, airplane, boat, motorcycle or bicycle.
- Emergency communications demonstrations with portable equipment.
- Medical data transmission experiments, including the transmission of analog or digital physiological data (e.g., ECG's and EEG's).
- Data collection from remote, unattended ground terminals.
- ASCII data transmission experiments, including remote accessing of digital computers.
- Slow-scan and medium-scan television experiments.
- Remote control experiments (such as radio-control aircraft, garage-door opener, remotely controlled kitchen ovens, etc.)
- Transponder interlinking experiments between different Phase II spacecraft.
- Multiple-access experiments (such as quantitative experiments to evaluate the effects of power sharing with different modulation techniques).
- Ground station automation (closed-loop monitoring of downlink signals and automatic adjustment of uplink power and frequency).
- "Broadcast" demonstrations using the transponder in a single-access mode, evaluating performance for different modulation modes.
- Extended range communications experiments to attempt transmission or reception beyond the normal maximum satellite range.
- Low-power (QRP) user experiments to determine the minimum power needed to sustain communications.
- Traffic nets scheduled on the satellite.
- Automatic tracking of ground station antennas in azimuth and elevation (either on an open-loop or closed-loop basis).
- Unattended, automatic telemetry data collection (e.g., using tape recorders for later analysis).
- Unattended online or offline computer processing of received Morse code telemetry data, with printout of parameter values and units. Automatic decoding of Morse code characters in the presence of noise.
- Experiments involving physical parameters, e.g., determination of spacecraft spin characteristics and orientation.

OSCAR IN THE CLASSROOM

BY Steve Place WBLEYI
OSCAR Education Program Manager

The challenge of innovative technology ---- continuity of service
---- exciting new launch opportunities ---- competition for NASA
"piggyback" flights ---- real contribution of the OSCAR Program within
the community ---- reliable emergency communications ---- low orbit
tracking ---- Russian RS series ---- elliptical orbit tracking

These are a few of the many topics discussed in spirited exchanges at the AMSAT Annual Meeting -- topics that directly affect each and every one of us involved in amateur radio satellite communication. But the impact of our decisions and efforts extends far beyond our ranks, reaching thousands of students in hundreds of classrooms around the world who use OSCAR in their daily class routine. What to us may be an intriguing or novel communication technique, may to a student be the stimulus needed to revitalize his interest in a physics course -- or mathematics, or geography, or space science, or ...

What is the OSCAR Education Program? It's a cooperative effort of creative teachers, eager students and concerned radio amateurs across the country who work hand in hand to bring the excitement of satellite communication into their classrooms. It's learning through active participation by students who might otherwise become discouraged and disinterested. It's the cooperation and mutual support of AMSAT and the ARRL in providing both the orbiting hardware and the classroom guides and materials that make the classroom experience a success. It's students seeing their studies come to life, students getting involved in their work, actually using what they are learning and getting immediate, relevant, real-life feedback on their efforts.

How does the program work? Through newspapers, professional journals, teacher resource indexes, amateur radio publications, local clubs and individuals, educators hear of the program and write to AMSAT or the ARRL. The ARRL then supplies a complete package of necessary information, including a copy of Space Science Involvement (a curriculum guide currently under revision by the ARRL and originally written by educators at the Talcott Mountain Science Center), a copy of Getting to Know OSCAR From the Ground Up, an OSCARLOCATOR and orbit schedule, telemetry forms, summary sheets, tips on giving demonstrations, AMSAT information, reprints from several magazines, and the latest OSCAR in the Classroom (the OSCAR Education Program Newsletter). We also supply on request the name of a satellite user or interested Ham in the local area to assist in getting their program going. Hundreds of these packets are sent out every year and we now have over 1300 schools and educators on the mailing list.

"OK -- Great, but what can I do?" As a member of AMSAT you obviously care about the future of the radio amateur satellite program. Many of us wish we could make more of a personal contribution but feel that we haven't the technical expertise or the time for a regular commitment. Here's the chance for you to make a meaningful contribution that will not only help to improve the quality of education for your children, but will also help to ensure continued success in the competition for choice launch opportunities.

Many people have found many ways to lend a hand. At the very least you can volunteer to help schools in your area should they request assistance. Whether you have 2 way capability, receive only, or can lend a little moral support (some teachers feel reassured if



AMSAT

a licensed radio amateur is there to help string a 10 meter dipole, plug in the receiver, tune in the right frequency and explain the "strange" sounds that emanate from the speaker), YOU are needed.

Are you a teacher? Consider using OSCAR in your classroom and spread the word among your fellow faculty. You may find enough strength in numbers to obtain local funding for a school station! And innovative teaching approaches are well respected these days.

Not satisfied with a passive role? Then go out into your community and actively "sell" your School Committee on bringing its schools into the space age. If you plan on giving a demonstration, let us know well in advance and we'll send you our demonstrator's kit and help you in any other way possible. One exciting idea has recently been developed into a full scale course by Dennis Brown, an elementary school principal in Lakefield, Minnesota. He, with the help of local amateurs (notably WAØUNS) is conducting two weekend seminars on OSCAR use in the classroom for nearly ONE HUNDRED area teachers! He took the initiative, obtained a grant from his state's Council on Quality Education and has followed through admirably. (Incidentally, Dennis' daughter did a science fair project on OSCAR for which she won local and regional honors -- to the Browns, OSCAR is a member of the family.)

Others have contributed in many ways in the past and continue to do so today. Special thanks go to W2GN and the OSCAR Education Bulletin Stations, W6DOW, W6ELT, K4UQ, WA4DYL, W6CG and W4DWN, who are responsible for the bulletins beamed to classrooms several mornings each week. And special mention should also be made of Marty Davidoff who has written an excellent manuscript on educational applications of the OSCAR satellites. And our thanks again to those of you who have previously submitted your names as OSCAR Ed volunteers, those who have already assisted in the classroom and those who have sent photographs and stories of students using the satellites in their daily studies.

Whatever your resources, if you are concerned about the future of amateur radio, the OSCAR program and the quality of education at your local schools, please drop me a line. The OSCAR Education Program is one of the best demonstrations for the concern and involvement of today's radio amateur.

The ARRL hopes you will do your part to help make the OSCAR Education Program a resounding success. If you assist a teacher in your local area by giving a demonstration or lecture, have the teacher briefly state your name and what you did on a piece of school stationery. Send this note and a summary of your activities (with clear black and white photographs if possible) to OSCAR Ed, 225 Main Street, Newington, CT 06111. This will help us keep our records of your contributions up to date and enable us to publish periodic summaries in the AMSAT Newsletter. In return, we will send you a complimentary copy of the 1977 Radio Amateur's Handbook (which you may keep or donate to the school library) as a small token of our sincere appreciation.

OSCAR EDUCATION BULLETINS

Want to hear firsthand what's happening in the OSCAR Education Program? Here's how to tune in the Educational Bulletins that are beamed to students across the continent throughout the year. Every weekday that OSCAR 7 is in Mode A, listen around 29.490 MHz during the first two appropriate morning passes (those passes accessible to North American classrooms during school hours). Whenever Mode B falls on a Wednesday, you can catch the bulletins around 145.950 MHz on the same morning passes. We thank you in advance for your cooperation in keeping downlink signals off these bulletin frequencies on the morning orbits.

THE ORBITAL PREDICTION OF OSCAR-7 BY THE USE OF PROGRAMMABLE POCKET SIZE ELECTRONIC CALCULATORS

BY YASUO NAKAMURA, JA2WO

The price of pocket calculators is decreasing daily due to new developments in electronics.

There are many different kinds of pocket electronic calculators in the world. I have an HP-25 (YHP-25 in Japan). I wrote a program of orbital prediction calculation for AMSAT-OSCAR 7. The program is shown in the table.

Operation 1:

We must store a few values into the registers R0, R1, R2, R4 of calculator HP-25.

- (1) We store numerical value 1 into register R0, in order to increase orbit number one by one.
- (2) We store numerical value 360 into the register R4 because one circle is 360 degrees.
- (3) We store numerical value 24 into the register R3 because one day is 24 hours.
- (4) We store numerical value 28.736208, which is the shift of the earth's rotation (degrees) during one orbit of AMSAT-OSCAR 7, into register R2.
- (5) We store numerical value 1.9157463, which is revolution period (unit:hour) of AMSAT-OSCAR 7, into register R6.

The revolution period of AMSAT-OSCAR 7 is 114.94478 (minutes). So we can get the numerical value 1.9157463 from the following calculation $114.94478 \div 60 = 1.9157463$.

Operation 2:

- (1) We push the key of calculator following the program which is shown in the table.
- (2) We push key $\boxed{f}$ $\boxed{PRGM}$ in order to reset 00 step of calculator before setting initial data.
- (3) We set initial data into 00 step as following longitude, ENTER $\uparrow$, time, ENTER $\uparrow$, number.
- (4) We push key $\boxed{R/S}$ sequentially.

At first, after pushing key $\boxed{R/S}$, we can get the number of orbit. Next, after pushing key $\boxed{R/S}$, we can get the crossing time. Next after pushing key $\boxed{R/S}$, we can get the longitude, and so on...

Example:

If the data of initial orbit are as follows:

Orbit No: 12683, Crossing Time: 1.48 (GMT), Longitude: 81.1.

Initial operation: 81.1, ENTER $\uparrow$, 1.48, ENTER $\uparrow$, 12683.

(R/S) : 12684.	(R/S) : 3.43.	(R/S) : 109.85
(R/S) : 12685.	(R/S) : 5.38.	(R/S) : 138.60
.....		
.....		

I think there is room for improvements in this program, for example, if we use FRAC key, we will save a few steps of this program.

One of the weak points of this program is that the order which we set initial data is inverse to the order which we can get the orbital data after calculation. I think if we use a few more steps, we can arrange the same order.

I am very happy if anyone who is interested in this program suggests some improvements and uses this program in order to get orbital predictions.

Yasuo Nakamura (JA2WO)
1-9-8, Kamoe, Hamamatsu-city
Shizuoka-prefecture, 432
JAPAN

STEP	KEY	X	Y	Z	T
00		No	Time	Degree	
01	RCL 0	1			
02	+	$N_0 + 1$			
03	R/S	Display of $N_0 + 1$			
04	STO 7				
05	$X \leftrightarrow Y$				
06	$g \rightarrow H$	T'			
07	RCL 1	1.91			
08	+	$1.91 + T'$			
09	RCL 3	24			
10	$X \leftrightarrow Y$				
11	$f X < Y$	$1.91 + T'$	24		
12	GTO 17				
13	$X \leftrightarrow Y$	24	$1.91 + T'$		
14	-	$1.91 + T'$			
15	RCL 3	24			
16	$X \leftrightarrow Y$	$1.91 + T'$	24		
17	$f HMS$	$(1.91 + T')$			
18	R/S	Time	Display		
19	STO 6				
20	R ↓				
21	R ↓				
22	R ↓				
23	RCL 2	28			
24	+	$D + 28$			
25	RCL 4	360			
26	$X \leftrightarrow Y$				
27	$f X < Y$	$D + 28.7$	360		
28	GTO 33				
29	$X \leftrightarrow Y$				
30	-	$(D + 28.7) - 360$			
31	RCL 4	360			
32	$X \leftrightarrow Y$				

(Continued on page 29)

AMSAT-OSCAR 7

REFERENCE ORBITS
1978

AMSAT-OSCAR 7

Ref Orbit	Date 1978	Time (UTC)	Long °W	Ref Orbit	Date 1978	Time (UTC)	Long °W
14311B	1 JAN	0039	65.2	15188B	12 MAR	0045	67.9
14324B	2 JAN	0133	78.8	15201A	13 MAR	0140	81.4
14336A	3 JAN	0032	63.7	15213B	14 MAR	0039	66.3
14349B	4 JAN	0126	77.3	15226B	15 MAR	0133	79.9
14361B	5 JAN	0026	62.1	15238A	16 MAR	0033	64.7
14374A	6 JAN	0120	75.7	15251B	17 MAR	0127	78.3
14386B	7 JAN	0019	60.5	15263B	18 MAR	0026	63.2
14399B	8 JAN	0114	74.1	15276A	19 MAR	0121	76.7
14411A	9 JAN	0013	59.0	15288B	20 MAR	0020	61.6
14424B	10 JAN	0107	72.6	15301B	21 MAR	0114	75.2
14436B	11 JAN	0007	57.4	15313A	22 MAR	0014	60.0
14449A	12 JAN	0101	71.0	15326B	23 MAR	0108	73.6
14461B	13 JAN	0000	55.8	15338B	24 MAR	0007	58.5
14474B	14 JAN	0055	69.4	15351A	25 MAR	0101	72.1
14487A	15 JAN	0149	83.0	15363B	26 MAR	0001	56.9
14499B	16 JAN	0048	67.9	15376B	27 MAR	0055	70.5
14512B	17 JAN	0143	81.4	15389A	28 MAR	0149	84.1
14524A	18 JAN	0042	66.3	15401B	29 MAR	0049	68.9
14537B	19 JAN	0136	79.9	15414B	30 MAR	0143	82.5
14549B	20 JAN	0035	64.7	15426A	31 MAR	0042	67.4
14562A	21 JAN	0130	78.3	15439B	1 APR	0137	80.9
14574B	22 JAN	0029	63.2	15451B	2 APR	0036	65.8
14587B	23 JAN	0123	76.7	15464A	3 APR	0130	79.4
14599A	24 JAN	0023	61.6	15476B	4 APR	0030	64.2
14612B	25 JAN	0117	75.2	15489B	5 APR	0124	77.8
14624B	26 JAN	0016	60.0	15501A	6 APR	0023	62.7
14637A	27 JAN	0111	73.6	15514B	7 APR	0118	76.2
14649B	28 JAN	0010	58.4	15526B	8 APR	0017	61.1
14662B	29 JAN	0104	72.0	15539A	9 APR	0111	74.7
14674A	30 JAN	0004	56.9	15551B	10 APR	0011	59.5
14687B	31 JAN	0058	70.5	15564B	11 APR	0105	73.1
14700B	1 FEB	0152	84.1	15576A	12 APR	0004	58.0
14712A	2 FEB	0052	68.9	15589B	13 APR	0058	71.5
14725B	3 FEB	0146	82.5	15602B	14 APR	0153	85.1
14737B	4 FEB	0045	67.3	15614A	15 APR	0052	70.0
14750A	5 FEB	0139	80.9	15627B	16 APR	0146	83.6
14762B	6 FEB	0039	65.8	15639B	17 APR	0046	68.4
14775B	7 FEB	0133	79.3	15652A	18 APR	0140	82.0
14787A	8 FEB	0032	64.2	15664B	19 APR	0039	66.8
14800B	9 FEB	0127	77.8	15677B	20 APR	0134	80.4
14812B	10 FEB	0026	62.6	15689A	21 APR	0033	65.3
14825A	11 FEB	0120	76.2	15702B	22 APR	0127	78.9
14837B	12 FEB	0020	61.1	15714B	23 APR	0027	63.7
14850B	13 FEB	0114	74.6	15727A	24 APR	0121	77.3
14862A	14 FEB	0013	59.5	15739B	25 APR	0020	62.2
14875B	15 FEB	0108	73.1	15752B	26 APR	0115	75.7
14887B	16 FEB	0007	57.9	15764A	27 APR	0014	60.6
14900A	17 FEB	0101	71.5	15777B	28 APR	0108	74.2
14912B	18 FEB	0001	56.4	15789B	29 APR	0007	59.0
14925B	19 FEB	0055	69.9	15802A	30 APR	0102	72.6
14938A	20 FEB	0149	83.5				
14950B	21 FEB	0048	68.4				
14963B	22 FEB	0143	82.0	15814B	1 MAY	0001	57.5
14975A	23 FEB	0042	66.8	15827B	2 MAY	0055	71.0
14988B	24 FEB	0136	80.4	15840A	3 MAY	0150	84.6
15000B	25 FEB	0036	65.2	15852B	4 MAY	0049	69.5
15013A	26 FEB	0130	78.8	15865B	5 MAY	0143	83.1
15025B	27 FEB	0029	63.7	15877A	6 MAY	0043	67.9
15038B	28 FEB	0124	77.3	15890B	7 MAY	0137	81.5
15050A	1 MAR	0023	62.1	15902B	8 MAY	0036	66.3
15063B	2 MAR	0117	75.7	15915A	9 MAY	0131	79.9
15075B	3 MAR	0017	60.5	15927B	10 MAY	0030	64.8
15088A	4 MAR	0111	74.1	15940B	11 MAY	0124	78.4
15100B	5 MAR	0010	59.0	15952A	12 MAY	0024	63.2
15113B	6 MAR	0105	72.6	15965B	13 MAY	0118	76.8
15125A	7 MAR	0004	57.4	15977B	14 MAY	0017	61.7
15138B	8 MAR	0058	71.0	15990A	15 MAY	0111	75.2
15151B	9 MAR	0152	84.6	16002B	16 MAY	0011	60.1
15163A	10 MAR	0052	69.4	16015B	17 MAY	0105	73.7
15176B	11 MAR	0146	83.0	16027A	18 MAY	0004	58.5

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Ref Orbit	Date 1978	Time (UTC)	Long ° W
16040B	19 MAY	0059	72.1
16053B	20 MAY	0153	85.7
16065A	21 MAY	0052	70.5
16078B	22 MAY	0147	84.1
16090B	23 MAY	0046	69.0
16103A	24 MAY	0140	82.6
16115B	25 MAY	0040	67.4
16128B	26 MAY	0134	81.0
16140A	27 MAY	0033	65.9
16153B	28 MAY	0128	79.4
16165B	29 MAY	0027	64.3
16178A	30 MAY	0121	77.9
16190B	31 MAY	0021	62.7

16203B	1 JUN	0115	76.3
16215A	2 JUN	0014	61.2
16228B	3 JUN	0108	74.7
16240B	4 JUN	0008	59.6
16253A	5 JUN	0102	73.2
16265B	6 JUN	0001	58.0
16278B	7 JUN	0056	71.6
16291A	8 JUN	0150	85.2
16303B	9 JUN	0049	70.1
16316B	10 JUN	0144	83.6
16328A	11 JUN	0043	68.5
16341B	12 JUN	0137	82.1
16353B	13 JUN	0037	66.9
16366A	14 JUN	0131	80.5
16378B	15 JUN	0030	65.4
16391B	16 JUN	0124	78.9
16403A	17 JUN	0024	63.8
16416B	18 JUN	0118	77.4
16428B	19 JUN	0017	62.2
16441A	20 JUN	0112	75.8
16453B	21 JUN	0011	60.7
16466B	22 JUN	0105	74.3
16478A	23 JUN	0005	59.1
16491B	24 JUN	0059	72.7
16504B	25 JUN	0153	86.3
16516A	26 JUN	0053	71.1
16529B	27 JUN	0147	84.7
16541B	28 JUN	0046	69.6
16554A	29 JUN	0141	83.2
16566B	30 JUN	0040	68.0

16579B	1 JUL	0134	81.6
16591A	2 JUL	0034	66.4
16604B	3 JUL	0128	80.0
16616B	4 JUL	0027	64.9
16629A	5 JUL	0121	78.5
16641B	6 JUL	0021	63.3
16654B	7 JUL	0115	76.9
16666A	8 JUL	0014	61.7
16679B	9 JUL	0109	75.3
16691B	10 JUL	0008	60.2
16704A	11 JUL	0102	73.8
16716B	12 JUL	0002	58.6
16729B	13 JUL	0056	72.2
16742A	14 JUL	0150	85.8
16754B	15 JUL	0050	70.6
16767B	16 JUL	0144	84.2
16779A	17 JUL	0043	69.1
16792B	18 JUL	0138	82.7
16804B	19 JUL	0037	67.5
16817A	20 JUL	0131	81.1
16829B	21 JUL	0030	66.0

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Ref Orbit	Date 1978	Time (UTC)	Long ° W
16842B	22 JUL	0125	79.5
16854A	23 JUL	0024	64.4
16867B	24 JUL	0118	78.0
16879B	25 JUL	0018	62.8
16892A	26 JUL	0112	76.4
16904B	27 JUL	0011	61.3
16917B	28 JUL	0106	74.9
16929A	29 JUL	0005	59.7
16942B	30 JUL	0059	73.3
16955B	31 JUL	0154	86.9

16967A	1 AUG	0053	71.7
16980B	2 AUG	0147	85.3
16992B	3 AUG	0047	70.2
17005A	4 AUG	0141	83.8
17017B	5 AUG	0040	68.6
17030B	6 AUG	0134	82.2
17042A	7 AUG	0034	67.0
17055B	8 AUG	0128	80.6
17067B	9 AUG	0027	65.5
17080A	10 AUG	0122	79.1
17092B	11 AUG	0021	63.9
17105B	12 AUG	0115	77.5
17117A	13 AUG	0015	62.4
17130B	14 AUG	0109	75.9
17142B	15 AUG	0008	60.8
17155A	16 AUG	0103	74.4
17167B	17 AUG	0002	59.2
17180B	18 AUG	0056	72.8
17193A	19 AUG	0151	86.4
17205B	20 AUG	0050	71.3
17218B	21 AUG	0144	84.8
17230A	22 AUG	0044	69.7
17243B	23 AUG	0138	83.3
17255B	24 AUG	0037	68.1
17268A	25 AUG	0131	81.7
17280B	26 AUG	0031	66.6
17293B	27 AUG	0125	80.2
17305A	28 AUG	0024	65.0
17318B	29 AUG	0119	78.6
17330B	30 AUG	0018	63.4
17343A	31 AUG	0112	77.0

17355B	1 SEP	0012	61.9
17368B	2 SEP	0106	75.5
17380A	3 SEP	0005	60.3
17393B	4 SEP	0100	73.9
17406B	5 SEP	0154	87.5
17418A	6 SEP	0053	72.3
17431B	7 SEP	0148	85.9
17443B	8 SEP	0047	70.8
17456A	9 SEP	0141	84.4
17468B	10 SEP	0040	69.2
17481B	11 SEP	0135	82.8
17493A	12 SEP	0034	67.7
17506B	13 SEP	0128	81.3
17518B	14 SEP	0028	66.1
17531A	15 SEP	0122	79.7
17543B	16 SEP	0021	64.5
17556B	17 SEP	0116	78.1
17568A	18 SEP	0015	63.0
17581B	19 SEP	0109	76.6
17593B	20 SEP	0009	61.4
17606A	21 SEP	0103	75.0
17618B	22 SEP	0002	59.9
17631B	23 SEP	0057	73.4

AMSAT-OSCAR 7

AMSAT-OSCAR 7

Ref Orbit	Date 1978	Time (UTC)	Long °W
17644A	24 SEP	0151	87.0
17656B	25 SEP	0050	71.9
17669B	26 SEP	0144	85.5
17681A	27 SEP	0044	70.3
17694B	28 SEP	0138	83.9
17706B	29 SEP	0037	68.8
17719A	30 SEP	0132	82.4

Ref Orbit	Date 1978	Time (UTC)	Long °W
18445B	27 NOV	0022	65.8
18458B	28 NOV	0116	79.4
18470A	29 NOV	0016	64.3
18483B	30 NOV	0110	77.9

17731B	1 OCT	0031	67.2
17744B	2 OCT	0125	80.8
17756A	3 OCT	0025	65.6
17769B	4 OCT	0119	79.2
17781B	5 OCT	0018	64.1
17794A	6 OCT	0113	77.7
17806B	7 OCT	0012	62.5
17819B	8 OCT	0106	76.1
17831A	9 OCT	0006	61.0
17844B	10 OCT	0100	74.5
17857B	11 OCT	0154	88.1
17869A	12 OCT	0054	73.0
17882B	13 OCT	0148	86.6
17894B	14 OCT	0047	71.4
17907A	15 OCT	0141	85.0
17919B	16 OCT	0041	69.9
17932B	17 OCT	0135	83.5
17944A	18 OCT	0034	68.3
17957B	19 OCT	0129	81.9
17969B	20 OCT	0028	66.7
17982A	21 OCT	0122	80.3
17994B	22 OCT	0022	65.2
18007B	23 OCT	0116	78.8
18019A	24 OCT	0015	63.6
18032B	25 OCT	0110	77.2
18044B	26 OCT	0009	62.1
18057A	27 OCT	0103	75.7
18069B	28 OCT	0003	60.5
18082B	29 OCT	0057	74.1
18095A	30 OCT	0151	87.7
18107B	31 OCT	0050	72.5

18495B	1 DEC	0009	62.7
18508A	2 DEC	0104	76.3
18520B	3 DEC	0003	61.2
18533B	4 DEC	0057	74.8
18546A	5 DEC	0151	88.3
18558B	6 DEC	0051	73.2
18571B	7 DEC	0145	86.8
18583A	8 DEC	0044	71.6
18596B	9 DEC	0139	85.2
18608B	10 DEC	0038	70.1
18621A	11 DEC	0132	83.7
18633B	12 DEC	0032	68.5
18646B	13 DEC	0126	82.1
18658A	14 DEC	0025	67.0
18671B	15 DEC	0120	80.5
18683B	16 DEC	0019	65.4
18696A	17 DEC	0113	79.0
18708B	18 DEC	0013	63.8
18721B	19 DEC	0107	77.4
18733A	20 DEC	0006	62.3
18746B	21 DEC	0101	75.9
18759B	22 DEC	0155	89.5
18771A	23 DEC	0054	74.3
18784B	24 DEC	0148	87.9
18796B	25 DEC	0048	72.8
18809A	26 DEC	0142	86.3
18821B	27 DEC	0041	71.2
18834B	28 DEC	0136	84.8
18846A	29 DEC	0035	69.6
18859B	30 DEC	0129	83.2
18871B	31 DEC	0029	68.1

BACK ISSUES AVAILABLE

Back issues of the Newsletter are available upon request in return for a donation to AMSAT.

If you specify what year you first joined AMSAT, we'll send you an assortment of ten earlier issues for \$10.00, or fifteen issues for \$15.00.

Certain pre-1974 and the September 1975 issues are not available.

Note that due to the time and effort involved in servicing back issue requests, the minimum donation should be \$10.00.

Write to Back Issues, AMSAT, P. O. Box 27, Washington, D. C., 20044.

18120B	1 NOV	0145	86.1
18132A	2 NOV	0044	71.0
18145B	3 NOV	0138	84.6
18157B	4 NOV	0038	69.4
18170A	5 NOV	0132	83.0
18182B	6 NOV	0031	67.9
18195B	7 NOV	0126	81.4
18207A	8 NOV	0025	66.3
18220B	9 NOV	0119	79.9
18232B	10 NOV	0019	64.7
18245A	11 NOV	0113	78.3
18257B	12 NOV	0012	63.2
18270B	13 NOV	0107	76.8
18282A	14 NOV	0006	61.6
18295B	15 NOV	0100	75.2
18308B	16 NOV	0154	88.8
18320A	17 NOV	0054	73.6
18333B	18 NOV	0148	87.2
18345B	19 NOV	0047	72.1
18358A	20 NOV	0142	85.7
18370B	21 NOV	0041	70.5
18383B	22 NOV	0135	84.1
18395A	23 NOV	0035	69.0
18408B	24 NOV	0129	82.6
18420B	25 NOV	0028	67.4
18433A	26 NOV	0123	81.0

DO'S AND DON'T'S FOR SATELLITE USERS

BY PAT GOWEN, G3IOR

Don't turn on your carrier, whistle, send CW or otherwise UNTIL you can hear the satellite as evidenced by the beacon. If you have a poor downlink and a good uplink, as the vast majority of European users have, the chances are that you will be blotting out someone's dx QSO who can hear you - and how!

Don't run more than 100 w. e.r.p. at any time, or you will push out those who are playing the game, and give them grounds for irresponsible operating also.

Don't call that rare dx station you have already worked if others are calling him, or you will be preventing them having a chance.

Don't call stations in your own area at horizon times, as they have but a few seconds daily in which to work the distant ones, but most of any orbit to work you.

Don't call CQ incessantly. A short burst is quite enough, then listen, otherwise you are depressing AGC and using up battery power unnecessarily. Many of the rare ones are crystal controlled, and you will need to listen for them, and they won't get in any way if everyone is transmitting.

Don't transmit SSB in the lower half of the satellite input segment, nor CW in the upper, or you will upset the common mode operation scheme. Also, keep 5 kHz clear of the beacon frequencies.

Don't transmit off schedule, nor on any Wednesday, unless you have specific permission to do so, otherwise you will be wrecking others' attempts at valuable work.

Do be aware of the other guy's horizon, as he may be trying to get those on the limit.

Do pay maximum attention to your receiving system, as when it is good enough you will hear returns from even 100 mW e.r.p. Mode B uplinks, and hence work a lot more dx, and run less power yourself. Attention to higher gain, lower angle and less noise on your downlink is cheaper and far more productive than anything else you can do.

Do tell other stations who are not qualifying for the above conditions, fifty times if necessary, as they will not cease their bad practice unless they are helped to realize that it is unethical.

Do listen attentively on the frequency that you are considering using, until you are sure that another station is not already there.

Do use the outer limits of the passband, thus avoiding the already overcrowded centre, and encouraging others to spread out too to avoid unnecessary QRM.

Do listen to codestore, bulletins, news items and the nets, and benefit by applying the updated operational information heard.

Do keep clear of specific frequencies where rare or weak ones are known to be, and do not sit there and call CQ hopefully, listen instead.

Do move off a frequency where you have answered a CQ or a call, as it is the original caller's frequency, and he may be crystal controlled.

Do let people know if you are crystal controlled, by adding "C.C" or "Xtal" with your call, so that they can comply with the above.

Do try to be patient enough to listen for and work the weak ones, as it is possibly their first OSCAR QSO.

Finally, do try to have meaningful QSO's via OSCAR, e.g. by spreading the word on new stations, schedules, and items of common interest, rather than merely exchanging a few numbers. Names and QTH's are a common courtesy on all amateur QSO's, so why not on OSCAR?

From "OSCAR News", No. 18, July '77

THE POWERS THAT BE

BY PAT GOWEN, G3IOR

The opinions aired in this article are not those of G3IOR as a member and representative of the AMSAT Board of Directors, but those of G3IOR as an OSCAR operator.

The purpose of the article is not to please and entertain, but to cause some degree of concern to those who enjoy, and both give and accept so much from the exciting use of our satellites.

The intention, at the risk of stepping on some toes, is to attempt to obtain both the recognition and co-ordinated action by fellow OSCAR enthusiasts in an effort to overcome some of the apparent tolerance toward those who are systematically destroying the common means of communication between those who are attempting to use the transponders in the way set out by AMSAT and the designers of the spacecraft, so that logical and sensible use can be seen to function, and indiscriminate anti-social employment ceases.

The history is that initially, AMSAT-OSCAR 6 was primarily and prematurely killed by the objectionable operation of ultra-high power users, i.e., those who continued, in the face of advice, pleas for common sense, calls for sanity of operation, etc. to employ grossly excessive powers even on scheduled "OFF" days.

The current situation is that now AMSAT-OSCAR 7, despite every effort that some of us can make, is continuously being subjected to unnecessary and enormous uplink powers, causing mode changes on a regular basis, and in the long term the demise of the satellite due to battery failure.

The situation in Europe is that some ten percent of Mode B users are regularly employing uplink powers calculated by ALC observation and known power uplink comparison to be in excess of 10 Kw e.r.p. with even a few using stated powers in excess of 50 Kw e.r.p. Thus, although we all know that QSO's are possible with only 100 mW e.r.p., and that 10 W e.r.p. is highly successful, and furthermore is more than adequate under any range or conditions, stations running even up to the maximum recommended power of 100 W e.r.p. cannot be heard while the ALC is maximised by the abusers, leaving them either to be forced to use high power themselves, or to lose interest. It is often impossible to tell these inconsiderate power-houses to desist, as few signals can get into the satellites while they are on to be able to tell them, unless one breaks the rules oneself!

AMSAT-UK, while doing little as yet in the building field, has devoted a disproportionate amount of time and postage costs in asking these most persistent offenders to play the game, and the reasons why they should. One particular station in France who regularly uses powers in the order of 15-20 Kw e.r.p. on Monday QRP days, and on Wednesdays also, has been asked by myself alone some six times to date, with no effect whatsoever.

Papers accepted at the last IARU Region 1 meeting requesting action on this behavior have had little if any effect, and the power escalation continues, with the result that many logically powered stations in remote and rare areas have little success while the satellite is within the range of the problem users.

We in Europe have suffered from the moronity since the flight of AMSAT-OSCAR 6 when the satellite(s) are sometimes impossible to use on evening and weekend orbits, but now, with the QRO menace causing Mode switching or total loss of any transponder, their effect is being evidenced to stations well beyond their normal crippling range! If no improvement occurs, the thoughts of what they are apt to do the Phase III, when the increased simplicity of a direct non-tracking large array is possible, bears consideration. They will then be directly audible by the entire Northern Hemisphere, and attenuate everyone!

One particular problem that we have here in Europe is large numbers of stations who have obtained their VHF phone only license without the need to ever know a note of CW. Thus, they cannot read codestore messages, have little idea of weak signal operation, cannot enter and thus ignore the many informative HF nets run by AMSAT-UK, and are only familiar with the wide open spaces where optimum power affects DX. It is apparent that their regional societies, IARU, AMSAT, and their license authorities are ineffective in reducing the problem that they are causing, thus, it is a problem that may lay in the hands of other users.

May I, sounding contrary to the usual "amateur spirit", recommend the following points.

1. Do not compliment stations on their strong signals, as if it was something to be proud of. If they are stronger than the beacon, then you are safe in assuming them to running unnecessarily high powers, so only call them to tell them to "QRP or QRT" ... and why!
2. Only use high power yourself momentarily to get a signal across to the problem causers to perform the above.
3. Encourage AMSAT to build a scanning ALC system into the next satellite so that QRO use is not only ineffective, but counter-productive as well.
4. Do not respond to QRO callers, but call those who are no stronger or who are weaker than you are, but say why you don't encourage excess power, too.
5. Talk ABOUT OSCAR when USING OSCAR to give some idea on the technicalities and the code of conduct to those who are so out of touch with it in every way except sheer brute force power.
6. Spend a little more time listening rather than calling those strong stations you have worked many times over. The less input, the greater the input sensitivity, and you will hear many a rare one come up out of the noise.
7. If you cannot tell the offending station because of the effect that he is having upon you, then write to him, which will also allow you to express your feelings in finer detail.
8. Write to the AMSAT Newsletter, listing the calls of those who persistently wreak the havoc. It may be possible to award the stations listed ten times or more a silver pin-through-the-coax in recognition of services rendered.

Finally, permit me to apologise for my apparent ill-will toward those who are blatantly continuing to assert the results of their unsociable activities upon the true enthusiasts, but five years of frustrated efforts of trying every other way has brought me to it.

It is now up to you, the logical users, to try to re-address the problem by your concerted efforts if the fantastic possibilities of the future satellites are to be realized by the vast majority.

To that vast majority - 73 - and success!

(Continued from Page 23)

STEP	KEY	X	Y	Z	T
33	R/S	Duplication of D			
34	RCL 6	$(1.91 + T)$	$D+28$	360	$(1.91 + T')$
35	RCL 7	$N_0 + 1$	↓	↓	↓
36	GTO 01	$N_0 + 1$	↓	↓	↓
37					

R_0	1	R_4	360
R_1	1.9157463	R_5	
R_2	28.736208	R_6	$(1.91 + T')$
R_3	24	R_7	$N_0 + 1$

MINUTES OF BOARD OF DIRECTORS MEETING

15 SEPTEMBER 1977

The AMSAT Board of Directors meeting of 15 September 1977 was held in Building 2, Goddard Space Flight Center, Greenbelt, Md. The meeting was called to order at 2015 by Executive Vice-President, Thomas Clark, WA3LND. The following persons attended:

Thomas Clark, WA3LND
Jan King, W3GEY
Charles Dorian, W3JPT
Perry Klein, W3PK

William A. Tynan, W3XO
Richard Daniels, WA4DGU
Robert Carpenter, W30TC

The meeting began with King reporting on developments concerning obtaining a suitable facility for AMSAT. King and Clark have approached GSFC through the Public Information Office, looking for at least 1000 square feet of working space, either vacant existing space or a place to erect our own prefab building. Locations adjacent to the GSFC Radio Club or to the Visitors Center were mentioned. Apparently a prefab building would not be appreciated next to the Visitors Center, though the PIO would like us there (with a picture window) to show visitors a satellite under construction. A building about 24 by 36 feet is contemplated.

Clark felt that financial guidelines were needed in order to continue the negotiations.

There was an agreement without dissent that negotiations continue with a tentative limit of \$10,000 expenditure on AMSAT's part. The Board will act on any tentative agreement at the appropriate time.

Tynan proposed that \$10,000 be allocated for facilities on GSFC grounds. Clark felt that this was a vote of confidence, but that a final commitment should not be made at this time.

There was a short discussion of the proposed gift of equipment by K8MYN.

There was a discussion of the heavy workload on the volunteers in the AMSAT administrative arm, particularly those handling membership applications and renewals. King proposed that AMSAT employ a person for office work on membership/administrative work. Klein suggested that the apartment next to his will be available for use as an office. King stated that the negotiations with GSFC indicated that they expected AMSAT to have a person on duty there during working hours. This would be a reasonable work station for the proposed employee. Clark suggested employment of a recent-graduate ham such as the ARRL often employs. Klein moved that the Board of Directors authorize the employment of administrative help. This was seconded by King, and approved by those present. Clark suggested placing a notice in HR Report.

There was considerable discussion of a request from ARRL for use of the AMSAT mailing list to advertise their new publication "Getting to Know OSCAR from the Ground Up." On a motion by Dorian, seconded by Tynan, this use was approved. Clark abstained.

Klein noted a letter from the Secretary requesting to be replaced after the 24 October 1977 Administrative Volunteers meeting.

There was a discussion of the progress and management of the AO-D project. Klein, the project manager, felt that progress was sufficiently advanced to ensure meeting the 17 February 1978 launch date. King wished that Daniels part in the construction of AO-D be recognized by all. Klein gave a short review of the status of AO-D components. He will present a detailed schedule to Board members by 22 September 1977. There will be a status report to ARRL on 9 October 1977. A dry-run of the ARRL presentation will take place 5 October 1977.

King noted that the project manager of Landsat is still objecting to the launch of AO-D with his flight on a load margin basis.

Clark played a portion of a tape letter from Gowen, G3IOR, a member of the Board. The portion commended the decision at the last Board meeting to encourage Board members to participate in hamfests, etc., in order to keep the membership from feeling cut off from AMSAT. Clark summarized two other comments from Gowen: (a) On the subject of an assignment for the University of Surrey control station, King noted that they will again be needed for AO-D, but that a useful task would be an automated telemetry reception station; (b) On the subject of violators of

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Ретранслятор: как через него работать?

(Translation from the Russian by K3KWJ)

В. ДОБРОЖАНСКИЙ,
лауреат Государственной премии СССР

Реперная трасса и диаграмма слежения, построенная относительно местонахождения земного приемно-передающего пункта радиосвязи, позволяют получить практически все необходимые данные об орбитах ИСЗ, проходящих в зоне радиовидимости этого пункта*.

В этой статье мы разберем характерные особенности связи через космический ретранслятор, чья проведением QSO далеко не исчерпываются возможности использования учебно-экспериментальных спутников для любительских целей. В дальнейшем будут рассмотрены методы проведения траекторных измерений, приема телеметрии, учебных задач, массовых научных экспериментов.

Однако сначала о самом ретрансляторе. Он конструируется с таким расчетом, чтобы обеспечить свободный, многостационарный доступ в заданной полосе частот и передаче на другой частоте принятых сигналов без демодуляции, в реальном масштабе времени.

Перенос частоты в пределах одного относительно узкого любительского диапазона сопряжен с определенными трудностями. Поэтому частота приема и передачи обычно разнится на смежные любительские диапазоны, например 144 и 28 МГц. На рис. 1 показано возможное расположение рабочих частот в диапазонах 144 и 28 МГц с ретранслируемой полосой около 50 кГц.

В задачи бортовой аппаратуры, кроме того, входит регулярная передача через радиомаяк опознавательных сигналов, служебной информации, телеметрических данных, а также прием сигналов командной радиолинии (КРЛ) по управлению работой бортового комплекса. Поскольку работа маяка и прием сигналов командного комплекса осуществляются в пределах этой же полосы, то участок свободного доступа будет несколько меньше 50 кГц.

Разнос частот передачи и приема на смежные диапазоны создает ряд преимуществ для радиолюбителей. Это позволяет осуществлять связь через ИСЗ, используя достаточно простую аппаратуру. Более того, они получают возможность при проведе-

One of the basic conditions in operating through a satellite repeater is strict discipline in respecting the permitted power level. Attention was drawn above to the limited nature of the dynamic passband of the repeater. The useful repeated power must not exceed 50-100 mW. In this event with a maximum useful repeater power of 1.0-1.5 Watts up to twenty and more c.w. and SSB radiostations can operate simultaneously.

It is enough for several radiostations to exceed significantly the permitted level for the repeater to be pulled out of linearity, at which point the stronger stations, even with sufficient spacing between frequencies, will interfere with the weaker ones. The possibility of such a phenomenon can be illustrated by the following example. Let us suppose that at the extreme distance ($\delta = 0^\circ$) the signal level of the earth station corresponds to a radiated power from the repeater of 60-80 mW.

Figure 4 shows the relationship of the slant range and the angle of location δ . As the satellite approaches and the angles increase even to $\delta = 50-60^\circ$, the slant range decreases by more than three times.

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будут создавать помехи для менее мощных. Возможность такого явления может быть проиллюстрирована на следующем примере. Предположим, что на предельной дальности ($\delta = 0^\circ$) уровень сигнала земной радиостанции будет соответствовать излучаемой мощности ретранслятора в 60-80 мВт.

На рис. 4 показана зависимость наклонной дальности от угла места δ . По мере приближения спутника и выхода на большие углы, уже при $\delta = 50-60^\circ$, наклонная дальность уменьшится более чем в три раза.

При этом почти в десять раз воз-

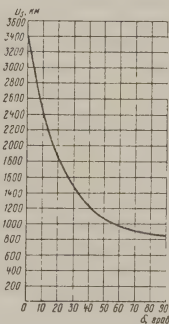


Рис. 4. Наклонная дальность в зависимости от угла места ИСЗ при $H = 861$ км

растает мощность входного, а следовательно, и выходного сигнала ретранслятора, что неизбежно приведет к его перегрузке. Поэтому в процессе связи необходимо уменьшать излучаемую мощность земного передатчика по мере сокращения наклонной дальности.

Критерием нормального сигнала по мощности могут показывать S-метра. В этом случае не должно быть сигнала радиомаяка.

Может возникнуть ситуация, когда при нормальном уровне сигнала земных радиостанций из-за большого количества радиостанций наступит перегрузка ретранслятора. Это может быть обнаружено при прослушивании ретранслируемого участка по появлению заметных перекрестных искажений, подавлению слабых сигналов более сильными. Очевидно, в таких случаях на некоторое время полезно отказаться от работы. В любом случае следует стремиться работать с минимально возможной мощностью.

Следует отметить, что вопросы методики проведения QSO, дисциплины, спортивной корректности, имеющие большое значение в любительской практике, приобретают особое значение при работе через учебно-экспериментальные спутники связи.

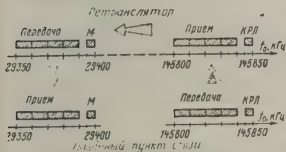


Рис. 1. Примерное распределение частот ретранслятора: М — радиомаяк; КРЛ — командная радиолиния

* См. «Радио», № 7, с. 17-19.

AMSAT VOLUNTEERS MEETING

A meeting of the AMSAT volunteers assisting in the greater Washington area was held on 24 October 1977 at the NIH ARC station in Bethesda, MD. The meeting was chaired by Bob Carpenter, W3OTC, and took place between about 10:00 and 16:00 EDT with a 45 minute lunch break. A tape recording of the meeting was made for the benefit of Pat Gowen, G3IOR. Volunteers in attendance at the meeting were:

Bob Balcom	W3PZK
Bob Carpenter	W3OTC
Ed Clammer	W3UN
Tom Clark	WA3LND
Martin Davidoff	K2UBC
Art Feller	W4ART
Bill Hook	W3QBC
Joe Kasser	G3ZCZ

Jan King	W3GEY
Perry Klein	W3PK
Larry Martin	W3IBO
Walt Rader	WA3DMF
John Shew	N4QQ
Earl Skelton	N3ES
Bill Tynan	W3XO
Will Webster	WB2TNC

Items discussed were as follows:

1. OBJECTIVE OF THE MEETING: Perry Klein, W3PK, stated the purpose of the meeting, viz., to review the current status of volunteer efforts and in so doing to (1) identify possible problem areas and recommend solutions and (2) avoid duplication of efforts and thus attempt to streamline operations.

2. "WHO'S WHO IN AMSAT": Bob Carpenter, W3OTC, reported that the directory "Who's Who in AMSAT" identifying most all AMSAT principals by name, function, address, and telephone number, is being updated and would be distributed to all persons listed in the directory.

3. MEMBERSHIP PROCESSING:

a. Gains and Losses in Membership: Bob Balcom, W3PZK, indicated that specific figures regarding the 1977 membership status were not yet available. Preliminary indications however suggest that the net membership is roughly constant with Life Member ranks growing at the expense of Regular Members. A problem of about 400 'backsliders' (regular members who fail to renew) was identified. One proposed solution was to forward a personalized appeal for membership renewal to each back-slider. W3PK indicated that the new AMSAT Administrative Assistant, Martha Saragovitz, may be able to handle this task.

b. New Member Enrollment: With the recent increased PR, processing of new member applications is running about two months behind, according to Larry Martin, W3IBO. Roughly 60 applications are currently awaiting action but no problems are foreseen.

c. Renewals: W3PK reported that, with the addition of the aforementioned Administrative Assistant, a new addressing system is being introduced which will permit "in-house" handling of most general membership related mailings. Expanded discussion on this point revealed the need for eventual computerization of both membership and user directories. Jan King, W3GEY, advised that a computer would be available at Goddard within the next two years and although its primary mission is directed toward Phase-III flight support, it was felt that administrative problems, as noted above, could also be dealt with on the computer. Joe Kasser, G3ZCZ, offered to investigate the possibility of using another machine during the interim. It was pointed out that any computer utilized by AMSAT should (1) be generally available to the volunteer community and (2) provide straightforward editing capabilities. An interactive facility accessible via telephone/teletype interface would be ideal.

d. Office Space Requirements: Bill Hook, W3QBC, indicated that the NIH ARC facilities, which continue to be extensively used for storage of AMSAT supplies, would no longer be available after June, 1978 due to large scale modifications underway at NIH. Thus a 'centralized' storage location for AMSAT paperwork is currently sought. W3GEY noted that any storage space at the proposed AMSAT facility at Goddard would probably be consumed by flight-related hardware. The problem remains.

4. FUND RAISING:

a. Solar Cell/Phase III Contributions: John Shew, N4QQ, advised that as of 1 October about 1200 solar cells (@ \$10) and 24 battery cells (@ \$200) had been sold. N4QQ urged greater utilization of the donor information, e.g., follow-

ing up next year with a personalized mailing to all previous donors requesting additional support.

b. Miscellaneous Income Producers: W3PK suggested that A-0-7 Orbital Calendar income might be supplemented in 1978 through production and distribution of similar A-0-D and RS calendars.

5. AWARDS, CERTIFICATES, AND CONTESTS: Earl Skelton, N3ES, reviewed the AMSAT awards program which is currently offering three satellite operating awards: AMSAT Oscar Award (AOA), Oscar Sexagesimal Award (OSA), and the recently created Oscar Century Award (OCA). As of 24 October, the number of awards issued are as follows: AOA - 162; OSA - 43; OCA - 3. (The OCAs have not yet been delivered due to delays in printing.) There are also seven local award managers participating in the awards program: DC9DC, F6BEG, G8KLO, OZ1WL, SP9DH, VK5HI, and ZL2GX. The award program is self-sustaining in that applicants are expected to pay for the return of all evidence submitted in support of award applications. It was noted that the number of received applications has been declining in recent months; a recommended solution was additional publicity. The question of an exclusive, i.e., satellite only, communications contest was raised but support was weak to non-existent.

6. TELEMETRY REPORTS: W3GEY advised that, although currently little use is being made of the A-0-7 telemetry data, it is important to continue this operation. He noted that teletype data are preferable to Morse and that more domestic teletype data are needed. W3GEY further advised that a large scale data reduction service was needed, e.g., to reduce say 30 days of telemetry data to a single page. A solution to this may be on the horizon.

7. ACTIVITY REPORTS: Walt Rader, WA3DMF, reported on the processing of Oscar activity reports. His extensive efforts to encourage non-AMSAT members submitting data to join the group were applauded by all. It was suggested that PR effectiveness of future Oscar demonstrations might be enhanced through on-site issuance of appropriate QSL cards to all participants.

8. QSL BUREAU: W3PK advised that three offers have been received to takeover operation of the AMSAT QSL Bureau from WALEHF. A decision regarding the next QSL manager had not yet been made.

9. NEWSLETTER: G3ZCZ noted no serious problems with the operation of the Newsletter, other than a need for the submission of copy. The continuing need for satellite articles, preferably with black and white photographic work, was stressed. Tom Clark, WA3LND, advised that a nice PR item describing the awarding of honorary AMSAT membership upon the noted science fiction writer Arthur C. Clarke could be ready for the December Newsletter. G3ZCZ requested that noteworthy items appearing on the Nets be forwarded to him for the purpose of documentation in the Newsletter. In response to this, it was agreed to provide Joe with copies of "HR Report" in which most of the 'hot' items are usually published the week following their appearance on the Nets.

10. Nets: Will Webster, WB2TNC, reported on the operations of the various AMSAT Nets. The effectiveness of Net operations was aptly demonstrated recently in terms of the annual election: a concerted effort was made during the two to three week period preceding the annual election to "get out the vote;" a three-fold increase in ballot receipts speaks for itself. The only anticipated change in Net operation times with the semi-annual conversion between DT and ST will be the local 2m FM Net, which will move from 00:00 Z to 02:00 Z (= 21:00 EST) -- all other Net operating times remain at the same UTC.

Ed Clammer, W3UN, briefly reviewed the operation of the 2m Net and the difficulties of simultaneous operation of more than one transmitter for Net operations were stressed by both W3UN and WB2TNC.

Regarding the operation of the 25/85 AMSAT repeater (WR3ABU), Bill Tynan, W3XO, introduced the idea of possibly shifting local 2m FM operations down into the newly opened 144.5+ MHz portion. Among other things, it was pointed out that this would avoid interference with the Havre de Grace machine (WR3ADH) which also uses the 25/85 channels. Considerable discussion ensued but the final consensus tended toward maintaining the status quo.

11. Miscellaneous:

a. W3XO suggested that an article be written for the Newsletter providing hints and suggestions for those setting up satellite demonstrations.

b. It was noted that Wednesdays, the days reserved for special experiments on A-0-7, are indistinguishable from any other day in Europe. A recommendation was made to investigate this problem.

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MINUTES OF 1977 ANNUAL MEETING

8 OCTOBER 1977

The 1977 Annual Meeting of the Radio Amateur Satellite Corporation was held on 8 October 1977, at the Employees Recreation Center, Goddard Space Flight Center, Greenbelt, Maryland. The meeting was called to order at 19:35 EDT by AMSAT Exec VP, Thomas Clark, WA3LND. There were approximately 75 members present including the following members of the Board:

Thomas Clark, WA3LND
Jan King, W3GEY
William Tynan, W3XO

Charles Dorian, W3JPT
Perry Klein, W3PK
Richard Zwirko, K1HTV

Clark thanked the Goddard Amateur Radio Club for acting as hosts for the meeting and furnishing the quarters. He introduced two members of that club, W3FA and WB2TNC/3. He then introduced those standing for election to the AMSAT Board of Directors; Webster, WB2TNC, Davidoff, K2UBC/3; King, W3GEY; Klein, W3PK; Skelton, N3ES; and Smith, VE3SAT, the last ballots having been collected earlier in the evening.

The Ballot Teller Committee was counting the ballots at this time. The committee consisted of W8DX, K2ZRO, K2OVS and W2GFF. W3PKZ assisted them in validating members from the membership list.

All attending the meeting were introduced.

AMSAT President Klein, W3PK, summarized the status of AMSAT. The regular membership is remaining relatively constant at about 2000, but life membership has increased about 30% and now stands at just over 700 life members. He noted that AMSAT-OSCAR 6 had finally failed earlier in the year, after over four years of operation. He mentioned 22 stations who had a significant role in the commanding of this satellite, thus contributing to its usable operation of more than four times its designed lifetime. He then mentioned that the scheduled launch date for AMSAT-OSCAR D was 17 February 1978, (now March 5, 1978).

Engineering VP King, W3GEY, spoke about the status of Phase III. Work is progressing. The liaison with the European Space Agency, the first launch provider, is quite satisfactory. The structural prototype for use in vibration tests was on display at the meeting. King noted that the Ariane launch in 1979 is fully approved and that space on a Spinning Upper Stage launched from a Shuttle flight in 1980 seemed likely to be available. He also mentioned the dilemma caused to AMSAT by the simultaneous possibility of space being made available on the Syncom 4 geostationary satellite carrying a 6-meter dish. He also emphasized his feeling of the importance of amateur radio performing public service activities.

Clark talked further on the attractions of a synchronous orbit. He also emphasized that AMSAT is primarily a volunteer organization and that many of our most vital technical workers feel the need for their AMSAT activities to contain technical challenges and that they would lose interest without new frontiers to conquer.

Webster, WB2TNC, objected to the strong emphasis on change. He felt that the emphasis was wrong and that the correct mode of operation for AMSAT (drawn from his work experience in the area of satellite application) would be to FIRST determine the users it intends to serve and then establish a satellite program emphasizing continuity of service to these users. In the case of the education program, he felt that considerably more detailed advice ought to have been given the educational community, such as lists of suggested equipment, etc., before satellite launch if possible. He pointed out the extremely limited discretionary funds available to most school science programs for the purchase of equipment for satellite stations. He felt that changes in new satellites ought to recognize the importance of continuity of service, even if it was mutually exclusive with another service which proved "interesting" to the satellite builders.

WA2LQQ commented that AMSAT is a subset of amateur radio, which recognizes TWO major goals, the advancement of the art technically, and public service.

Clark commented that his disagreement with Webster was one of degree, but noted that he was attracted to AMSAT because he found it to be the most technically advanced set of hams. He felt that AMSAT had a duty to do some technical pushing to encourage its users to advance technically.

WA4BUE, from the Norfolk area, commented that he had only been active on satellites for a couple of years and that AMSAT should recognize that there will always be people just learning about satellites who will need something achievable as a first step into the field.

Dorian, W3JPT, gave a short talk as an outgoing member of the Board of Directors. He noted that he had been on the Board for eight years, and served as Secretary for over six. The press of his employment and heading WARC preparation committees in both the Amateur and Maritime services left him little time, and in any case he thought it was time for new blood on the Board.

Tynan, W3XO, also spoke as an outgoing Board member. He also cited the load in his job, as well as conducting the VHF column in QST as reasons for giving up the office. He went on to comment that the satellite program has brought many new people into VHF activity, especially in parts of the world where such activity never existed before. He encouraged satellite users to participate in earth-bound communication at VHF and UHF as well. In Africa and South America, AMSAT members have been discovering unusual terrestrial propagation conditions.

Operations VP Zwirko, K1HTV, gave a few operational suggestions. The major change is that starting 1 January 1978, OSCAR 7 will be on Mode A only one day of every three. The Mode A day will be days of the year that are exactly divisible by three. (3,6,9,12,...,363) Wednesday will continue to be experiment days. The change is brought about due to the imminent launch of A-O-D. There will also be a change in the location of the CW and phone subbands. Starting 1 January, CW will be in the LOWER end of the DOWN-LINK band on all AMSAT satellites. (See G3ZCZ Bandplan in this Newsletter).

The ballot tellers returned with the results of the Board election. The chief teller, Cotton, W8DX announced the results as follows:

Directors elected to the Board for two year terms:

Klein, 383 votes
King, 374
Smith, 204
Webster, 160

New Alternate Directors for one year terms:

Davidoff, 136
Skelton, 130

Webster, WB2TNC, spoke about the RS Russian amateur satellite program. There was little new information over that printed. The launch date is still unknown, quite possibly some major Russian historical anniversary.

Steve Place, WB1EYI, manager of the ARRL satellite education program, spoke about that program. He passed around a sample of a kit which is sent to interested educators.

George Barker, WB8PBC, also of ARRL, reported that the ARRL Foundation collected some \$15,000 as a result of their campaign earlier that year for funds for WARC preparation and for AMSAT.

Clark reported that the AMSAT Phase III donation program has collected approximately \$25,000 in the past year.

The meeting adjourned at 22:30.

Robert J. Carpenter, W3OTC
Secretary

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the AMSAT-OSCAR operating recommendations, band plans, experiment days, etc., he generally agreed with the Board action taken at the last meeting.

The meeting adjourned at 2315.

Robert Carpenter, W3OTC

AMSAT 1977 ANNUAL REPORT

BY PERRY KLEIN, W3PK

The number of AMSAT Life members rose to more than 700 during 1977. This represents a 30% increase over the 1976 figures. The number of regular members remained at about the same level as last year, that is 2065 members in 73 countries, because although many people joined AMSAT last year, about an equal number failed to renew their memberships.

Summary of Activity in 1977

AMSAT-OSCAR 6 reached the end of its useful operating lifetime in mid 1977 after having served for 4-1/2 years. From January through May, its Nickel-Cadmium battery cells began to fail one-by-one until the battery voltage became too low to support telemetry and command functions, with the result that the battery discharged completely. The longevity of AMSAT-OSCAR 6, which lasted far beyond its original one-year intended lifetime, is the direct result of the dedicated efforts of AMSAT's worldwide team of telecommand station operators, particularly VK3YDB, VK3ZDH, VK3ZQN, VK5HI and VK6HK in Australia, VE3HCR, VE3QB and VE3SAT in Canada, G3YJO in England, DJ4AU, DJ9DT and DL9GS in Germany, HA5WH in Hungary, CN8BO in Morocco, ZL1WB in New Zealand, and W1IOX, W6CG, W6ELT, K6HIJ, W6OAL, WA6ZKY and KH6IHP in the United States. These volunteers have spent countless hours sending hundreds of thousands of commands to AMSAT-OSCAR 6 in order to maintain its operation.

AMSAT-OSCAR 7, which reached its third birthday on November 15, continues in operation, although frequent "mode-jumping" has been occurring during the fall-winter operating season. This is thought to be caused by a combination of poor sun-angles on the spacecraft solar arrays (reducing the amount of battery charging current available) and the overpowering of the transponders by users running excessive transmitting powers.

The latest AMSAT-OSCAR users list compiled by WB2DNN and N3ES show 5,139 stations have communicated via AMSAT-OSCAR's 6 or 7 at one time or another; 3,749 of these have been confirmed by QSL cards or reports received. According to the compiled statistics, very nearly 40% of the users are in the United States, 12% are in Germany, 7% are in England, 4% are from Japan and another 2-1/2% are Canadian, and amateurs in these five countries comprise nearly two-thirds of the total users. The users list continues to be published in the form of an AMSAT-OSCAR users directory in the Radio Amateur Callbook.

During the year, work continued on AMSAT-OSCAR D (A-O-D), the spacecraft intended to replace AMSAT-OSCAR 6. The satellite is now expected to be launched around March 5, 1978, as a piggyback payload with the NASA LANDSAT-C earth resources technology satellite. Contributing to this project are members of the Japan AMSAT Association, who provided one of the two transponders and one of three power switching regulators aboard. AMSAT Deutschland members contributed another of the power regulators, a Canadian AMSAT member fabricated the spacecraft/launch vehicle attach fitting, and Project OSCAR members provided the spacecraft structure, module housings and other mechanical and electrical components. In all, over 30 technicians and engineers have been involved in the construction of A-O-D.

In February 1977, an agreement was signed between the American Radio Relay League (ARRL) and AMSAT in which ARRL is to assume all operations responsibility for A-O-D after launch. ARRL also agreed to contribute \$50,000 to AMSAT in reimbursement of A-O-D construction costs, and to lend AMSAT two of its best laboratory technicians to assist with the project.

Development of the AMSAT-Phase III satellite progressed, with the delivery of a prototype structural model of the spacecraft for vibration tests. A fund-raising program has been underway to raise the \$250,000 needed for two Phase III spacecraft, and about 10% has been contributed so far. The ARRL Foundation has been assisting in fund-raising efforts and has raised about another 10%. A computer simulation of the spacecraft antenna system was completed leading to a feasible antenna design. A high level microcomputer independent user program language was developed for the Phase III onboard COSMAC microcomputer, and approval of the launch of the first Phase III spacecraft on the Ariane second test flight was received (launch is in late 1979).

Discussions were held with NASA Goddard Space Flight Center management concerning the construction of an AMSAT building adjacent to the Goddard Visitor Center for use in AMSAT spacecraft integration and testing, and also containing office and storage space. Approval is expected, and it is hoped that a prefabricated

cated building structure can be completed by this winter.

Future Activities

A new series of OSCAR satellites called "RS" (for Radio-amateur Sputnik) has been announced as being planned by the Soviet Union, and it is anticipated that launch could take place at any time now. These satellites, according to information published by the International Frequency Registration Board and the Soviet journal Radio, will contain two-to-ten meter linear transponders using uplink frequencies in the 145.80 - 145.90 MHz range and downlinks in the 29.3 - 29.4 MHz region. It is expected that these satellites will be placed in 82° inclination, 950-kilometer circular, polar orbits with periods of 102-104 minutes. AMSAT welcomes this new series of Soviet amateur radio satellites in the spirit of international friendship and cooperation. We expect to assist with the distribution of orbital and operating information as soon as launch is confirmed.

AMSAT-OSCAR D spacecraft testing continues toward its planned launch, now in March, with thermal-vacuum, vibration and antenna tests planned. After launch, AMSAT will provide technical consultation to the ARRL, who will handle nearly all aspects of operations for this satellite.

AMSAT Phase III spacecraft design work will be completed during 1978, as will prototypes of the transponders, computer, attitude control/stabilization and power systems. The Phase III fund-raising program will also continue, largely with the assistance of the ARRL Foundation. It is certainly evident that 1978 will be a critical year for AMSAT and the Phase III program, both in terms of hardware and fund-raising.

Continued from page 31

In the process the power of the uplink, and consequently of the downlink, repeater signals increase by almost ten times, which inescapably leads to its overloading. Therefore, in the process of communication it is necessary to decrease the radiated power of the earth transmitter as the slant range decreases.

S-meter indications can serve as the criterion of a normal signal power level. In no case should this exceed the beacon signal level.

It may happen that even with normal earth station signal levels an overloading of the repeater is brought about by the large quantity of simultaneously operating stations. This can be determined by monitoring the repeated segment and noting noticeable distortions and suppression of weak signals by stronger ones. It is obvious that in such cases it is desirable to refrain from operation for some time. In any event it is necessary to strive to operate with the minimum possible power.

It should be noted that questions of the methodology of conducting QSO's, discipline, and correctness in sport -- which have great significance in amateur practice -- take on special significance in operation via educational-experimental communication satellites.

Continued From Page 33:

c. Art Feller, W4ART, suggested that more efficient money collection procedures were needed at hamfests, etc. Operations at the recent Gaithersburg hamfest could have been more streamlined.

d. On a philosophical note, WA3LND raised the question of where AMSAT was going in the next 5 to 10 years, i.e., would the AMSAT of tomorrow be a predominantly hardware oriented group devoted exclusively toward construction and testing of flight hardware with ARRL handling all administrative matters, or would it be a mammoth (relatively speaking) organization supporting all phases of the forthcoming communications explosion heralded by Phase-III? The question remained unanswered.

Earl Skelton, N3ES
AMSAT Setretary



"LETTERS AND COMMENTS"



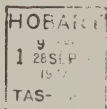
Dear Joe:

For some time now I have been wanting to drop you a note and congratulate you on the fine job you are doing with the Newsletter. The award you received was very appropriate! Over the years I have -- from time to time -- tried to edit a group bulletin or paper for different Ham groups and I know what a difficult task it can be. You are a real credit to AMSAT, Joe!

Coordinator activities picking up very fast now and requests for OSCAR talks at clubs and schools are really starting to pick up. If the RS Satellite goes up next week, I expect I'll have to take my phone off the hook.

Personal best wishes,

Bud Schultz - W6CG



Dear Joe:

Re: Thomas Gooding's letter about the Newsletter: The Newsletter is well done and a vital part of AMSAT. Keep it coming!

Bob Harrington - WA6HCA

Dear Sir:

I am very glad to be able to obtain information in the AMSAT Newsletter. Many people, however, use miles, feet & inches as the units of length in their articles in the Newsletter. But these units are not universal. In Japan, a long time ago, we used Ken, Syaku, as the units of length, but nowadays we don't use these native units, and we use universal units, meter, centimeter, kilometer. So I propose we should use meters, centimeters, and kilometers as the units of length.

Yasuo Nakamura - JA2WO



Dear Joe,

Please carry on with AMSAT-80 articles as articles of that sort are our only source of information on the subject. I am still at the stage of deciding what CPU to use, but no doubt eventually I'll sort that out. I agree with K9LSB that the Newsletter is worth every cent, my only regret being that I cannot constructively assist.

Activity here is looking up; there are 3 stations in Rotorua with Mode A capability and at least one other building a transverter. No activity Mode B but hopefully some on Mode J.

73's,

Phil, ZL1PK

Dear Mr. Kasser:

I have just returned from Tokyo where I go several times a year on business. During this trip I wore my lapel AMSAT pin which, I must say, created quite a stir among my Japanese friends. In a country where every company executive wears his company pin, my AMSAT pin out-shown them all!

It was my good fortune, while in Tokyo, to have dinner with my good friend, Harry Yoneda (JALANG), at the Foreign Correspondents Club. Harry, AMSAT Liaison for the area, gave me much needed background on the Japanese amateur satellite effort.

Please accept my congratulations on an excellent newsletter.

With best wishes,

Warren Birkenhead
KH6CA - LM-582

Dear Joe,

You've got a good publication, and it fills a real need, I believe.

My personal opinion is that only a few readers can benefit from too much Computer material. If it doesn't get too deep, it is good, but it can easily get beyond most of us (my personal opinion).

All the best for you, Joe.

73,

Wes Miller, LM-697
HB9AOY/W9LAB

Dear Joe,

Greetings from the far west. First off, I did not receive my June Newsletter and surely would like one if possible. We are getting a few converts here and had a good turn out for the OSCAR Demo by WA7ZBO and seminar by myself at the WIMU hamfest in Macks Inn, Idaho, August 5, 6, and 7.

Enclosed is a snapshot of several of us to assure you that there is activity out here.

Left to right are: W7RZY, Harry, Montana; W7JDZ, Mac, Idaho; WB7CCS, Ski, Idaho; K7ENE, Ron, Idaho; and WA7ZBO, Larry, Utah. Also, had Pop, W7OUX, from Wyoming at the hamfest but he wasn't available for the picture.

We put out a lot of literature and hope that we will have a few more on by the time the snow comes. Hope to have my 432 MHz antennas in shape in a few days and get on Mode B. I try to keep up on Mode A as much as possible. Best of everything.

73,
Harry, W7RZY

[You weren't the only member to miss the June Newsletter. I hope you have it by now. Anyone else who did not get a June issue, send a postcard requesting it to Box 27. -- Joe]



Dear Joe,

Your "Proposed Satellite Band Plan" as outlined in September's AMSAT Newsletter seems beyond criticism. Thank you for the thought and work, but the most work lies ahead: Getting it accepted. Please keep the idea alive with each issue of the Newsletter. Any one operating Mode B can attest to a "Band Plan" need. ...and please keep up the good work of publishing the Newsletter.

My sincere thanks,
Earl Tonjes, W4NG



Dear Joe,

Congratulations on winning in your class in the ARNS 1976 Publications Contest. MOBILE NEWS, the journal I edit, managed third place.

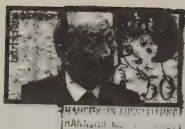
I'm beginning to wish I had never been issued with a call sign ending with a "K." You see, G3FP and me (G3FPK) have both operated through 0-6 and 0-7 for some years. Until recently, Bernard, G3FP, spent his time on Mode B but he has lately shown up on Mode A. In the past I have often been confused with G3FP and occasionally Bernard has forwarded QSLs sent to him in error.

The problem is twofold. First are the "too-quick-on-the-trigger" types who get as far as the G3FP part and then assume it is Bernard without waiting to hear the final letter. Second are those who think the final "K" is the "invitation to transmit" signal. In both cases subsequent attempts to correct the error are to little avail even when I send very deliberately - "de G3FPK KN."

Another problem is that some stations sometimes call me G3FPD, something which only happens on satellite QSOs. In common with many others I find I do not always copy a call sign correctly first time so always make a point of listening carefully each time the fellow sends it unless it is somebody whose fist or signal is unmistakable.

Finally, I had a letter from Dave Jarrell, CT2BS, who says he will be posted to Scotland in January 1978. Guess we may be hearing a GM5 on the satellite(s) in '78.

73,
Norman Fitch
G3FPK



Dear Joe,

Things have been busy here in the jungles and I haven't been on OSCAR as much as I would like. I did work VP2 several weeks ago for country #20. Things have worked out so we can continue here in Peru and I plan to be active as OA8V until June 1979. I'm running 25 watts output mode A to 5 el yagi up 51 feet tilted 10°. Receive is Ameco pre-amp and Drake R4B. On mode B I'm now on SSB using the Argonaut to drive a microwave transmitting converter at 7 watts out to 11 el yagi. Receiver is Rochester VHF converter and Drake R4B. I enjoy working QRP. I have 25 states and 20 countries.

If anyone would like to make a sked for either OSCAR Mode A or B, I'd be happy to try from this end.

I'm enclosing picture of station. I guess I've been too active on HF QRPp - trophy in background is #6 DXCC with 5 watts or less. Now have 166 countries worked with 5 watts.

Enjoy Newsletter. Hope I can try Phase III before leaving the jungle.

Vy 73,
Paul Wyse
OA8V
Casilla 2492
Lima 100, Peru



Dear Editor,

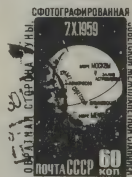
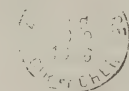
The Wheaton Community Radio Amateurs Inc. would like to take this opportunity to recognize both the past achievements, and future plans of AMSAT.

The successful construction, implementation, and operation of AMSAT's satellites have broadened the scope of Amateur Radio, and have opened new horizons for all amateur radio operators around the world. AMSAT has promoted Amateur Radio through its facilities and organization, and is probably directly or indirectly responsible for thousands of new amateur radio operators at a time when it is so important that the amateur ranks be well represented. The AMSAT organization serves as an example for all of Amateur Radio and has shown us our strength when our efforts are channeled for a common cause.

The Phase III project of AMSAT will have as much of an effect on our communications ability as VHF and UHF repeaters have had in recent years. This is particularly important in providing emergency and public service communications which our hobby is most dependent on. When in operation, the Phase III project will probably give us a look into the future of what Amateur Radio will be like in future years.

Therefore, the Wheaton Community Radio Amateurs Inc. unanimously voted to contribute \$1001.00 to AMSAT's Phase III project. We all hope that your project will be a success, and that every amateur radio operator will contribute to the future of our hobby individually or through his or her club organization.

Greg Chartrand, WA9EYY
President WCRA



Dear Joe,

I would like to thank all the members of AMSAT for making the OSCAR QSL Bureau a great success. As you well know, I have given the Bureau to Ross Forbes WB6GFJ. I know you will find him very capable for this great task. He's a fine chap, so give him a little time to get the ball rolling again. I would also like to thank Vic Politi, W1NU, for his endless help in getting the Bureau started, as we couldn't have done it without him. Good luck, Ross, with your new task.

73,
Dennis & Sharon Grindrod
WALEHF WAINBM

Dear Sir:

Regarding Tom (K4LHB)'s letter in the June Newsletter, the idea of having a "news letter" is great. Volume IX, Nr 2 told us that W3PK, et al. went to a meeting and that something leans 64° but didn't mention that OSCAR 6 is a wipeout and should not be used in present (the letter arrived 28 July).

The fact is that you have two entirely different groups of readers: the engineers (1) and the operators (2). The engineers appear to be well served by the letter. [We can only print material that we receive. -- Joe]

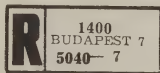
This operator (and other members of our club) would like to build a simple, solid state, CW xmitter, say on a 2"x6" fiberglass pc board (2N706, 2N3866, 2N5913, 2N3375) that could be attached directly to a delta-beam and run by a car battery 13 V for school demonstrations use. (The 2N3375 is Poly-Pak's bargain UHF transistor \$2.95.) How about a schematic and pc board layout for something like this -- in the Newsletter?? Having something to operate with would double the number of OSCAR-interested hams. An RF amplifier (tuned) to be attached directly at the receiver beam and a simple converter would be of value too. I've had a Rochester converter half built for 6 months, but can't find all the parts - mini SM's appear to be going off the shelves many places.)

I can't end this without complimenting all of you on the excellent job you are going on OSCAR's present and future.

Sincerely,

Marvin J. Berry, 3944
WBØLSN

[How about it readers? Has anyone built such a rig? If so, write about it... Has anyone tried the VHF Engineering Kits on OSCAR? -- Joe]



Continued From Page 17:

```
1000 IFL>0GOTO250
1020 PRINT""
1030 PRINT"OSCAR REPORT FOR ORBIT";J
1040 PRINT"DATE";D,E,F
1060 PRINT"LONGITUDE OF CROSSING";L;". ";G;"DEGREES"
2000 IFL>360PRINT"WHAT"
2002 IFL<110GOTO2600
2003 IFL<210GOTO2500
2004 IFL<319GOTO2600
2005 IFL<339GOTO2500
2006 IFL>340GOTO2600
2500 PRINT"THIS ORBIT IS NOT ACCESSIBLE FROM THIS QTH"
2501 RETURN
2600 PRINT"THIS ORBIT IS ACCESSIBLE FROM THIS QTH"
2601 RETURN
3000 END
```

Dear Editor:

First of all, count me as interested in seeing Part 2 of the computer information. While I am not interested in purchasing any equipment at this time, I will be in the future.

Second, would it be possible to repeat some of the "meaty" Newsletter articles from time to time to allow those of us who are new to satellite operations to catch up with the oldtimers? Maybe you could simply print a list of the best or most informative past articles with the date of the issue so we could order back issues (or at least know which issues to look for!).

Third, newcomers might be interested to know that it is helpful to have more than one type of antenna available when working through OSCAR 7. I have found that switching between a vertical and horizontal antenna for receiving gives excellent results on both Mode A and B. When the downlink signal fades on one, I switch to the other and usually find a dramatic change. For Mode A, the vertical (a 4BTV) does best on the horizon and the horizontal (a 100 foot wire) does better from elevation angles of 20° or greater. On Mode B, I sometimes switch to a Ringo Ranger vertical when the downlink signal fades. I normally use a 7 element horizontal beam on an az-el mount.

Of course, using circular polarization eliminates a lot of this but my method is cheaper for those already having a couple of antennas for FM, HF, or whatever.

Fourth, I find the Newsletter very informative, and I hope you keep up the good work!

73,
Carl Yaffey, K8NU

(There was a complete INDEX published in the December 1975 issue. For back issues see announcement on page 26. -- Joe)



MINUTES OF BOARD OF DIRECTORS MEETING

OCTOBER 9, 1977

The first meeting of the newly elected Board convened at 10:15 AM at the apartment of Perry Klein, W3PK, in Washington. In attendance were:

Tom Clark, WA3LND, Director
Marty Davidoff, K2UBC/3, Alternate Director (newly elected)
Jan King, W3GEY, Director
Perry Klein, W3PK, Director
Randy Smith, VE3SAT, Director (newly elected)
Rich Zwirko, K1HTV, Director

Attendance of Board meetings of our Directors from out of town was discussed, considering that three of the Directors are from Canada, England and Connecticut and travel is not always feasible. It was concluded that subjects discussed at the Board meetings would be summarized as to opinions and conclusions and conveyed to the out of town Board members by telephone for comment and vote. Agenda items will be mailed out in advance wherever possible to permit advance comment, although it was pointed out that the Board often meets at short notice to discuss "crisis" situations requiring rapid action.

Officers were elected for the next twelve months as follows:

President - Perry Klein, W3PK, was elected for a tenth one-year term.
Executive Vice-President - Tom Clark, WA3LND
Vice-President Engineering - Jan King, W3GEY, who also continues as AMSAT Phase III Project Manager.
Vice-President Operations - Rich Zwirko, K1HTV was elected for a third year.
Vice-President Special Programs - Bill Dunkerley, WA2INB, was elected to fill this new position.
Treasurer - Roy Rosner, K4YV, has agreed to serve for a third year.
Secretary - Earl Skelton, N3ES, has agreed to serve in this capacity.

All other officers, including Membership Chairman, Assistant Membership Chairman, Assistant Treasurer, Newsletter Editor, Awards Manager, Information Director, Asst. Information Director, Communications Net Manager, and AMSAT Area and Country Coordinators were reaffirmed. WALEHF, who for the last 4-1/2 years has been serving as AMSAT QSL Bureau Manager has asked to give up this job, but has agreed to continue to serve as Area Coordinator for Connecticut. He and his wife, Sharon, were commended for a job well done, and a replacement is being sought.

On Operations matters, the satellite users band plan as proposed by G3ZCZ in the September AMSAT Newsletter was approved for use with all AMSAT satellites, to take effect January 1, 1978. Efforts will be made to include it with the 1978 W6PAJ AMSAT-OSCAR 7 orbit calendar book.

On legal matters, the "AMSAT" trademark settlement agreement worked out between Norm Chalfin, K6PGX, and COMSAT's attorneys was approved by the AMSAT Board.

On financial matters, Perry Klein, W3PK was requested to prepare and submit to the Board a proposed AMSAT budget for 1978.

The meeting adjourned at 1 PM.

Perry Klein, W3PK

AMSAT NAME TAGS

2.5"x1.5" name tag. Useful at demonstrations and hamfests. \$5.00pp. LLORRY'S, 1852 South Reed St., Lakewood, Colo, 80226
Llorry will make a donation to AMSAT based on sales volume.

FLORESCENT AMSAT LABELS

Pressure sensitive labels, black letters on red background. 48 for \$1.25pp. W7ZC. Dave Middleton, Box 303, Springdale, Utah, 84767.

NEW AMSAT MAILING SYSTEM

AMSAT is in the process of converting to a new, in-house membership addressing system. If your Newsletter has an old-style address label and you have recently renewed, this label will not reflect your new expiration date.

AMSAT-STICKERS

Gummed glossy (\$.03c each) or clear acetate (\$.04c) pressure sensitive labels. Red AMSAT globe, blue letters. SAMCO, Box 203, Wyanntskill; NY, 12198. Sam will make a donation to AMSAT based on revenues.

THE AMATEUR RADIO CLUBS OF JPL AND HAC
TEST FLY JAMSAT (AMSAT MODE J) TRANSPONDER
OVER SOUTHERN CALIFORNIA IN SHAKEDOWN FLIGHT

For an hour-and-a-half Booth Hartley, N6BH, of the JPL Amateur Radio Club piloted his Beechcraft Bonanza over Southern California on November 5 carrying a prototype model of the AMSAT-OSCAR D Mode J transponder. Maurice Piroumian, WA60PB, of the Hughes Aircraft Co. Amateur Radio Club operated the ECHO II KLM 432/435 MHz receiver aboard to monitor the output of the Mode J transponder. The flight was in preparation for a full-scale all-day flight on December 3.

Just before the flight, tests were made on the ground with Skip Reymann, W6PAJ, and Gene Halaas, WB6GSP, who operated SSB through the transponder. Norm Chalfin, K6PGX, operated FM on a new WE800 Wilson into the transponder on 2 meters receiving the output on an inexpensive battery operated portable tuned down from the 450-470 MHz commercial band.

The Mode J beacon was keyed by a Prom operated keyer putting out "HI HI HI HI, DE WA3NDS AA-4". The keyer was built by Dick Ulrich, K6KCY. Dick was to have been aboard the aircraft but was grounded by a strep throat. He did, however, despite his discomfort manage to prepare the equipment for the flight.

At the QTH of N6IC, Don Bostrom, there were three ground stations set up:

John Dessel, WA6JML, operated the "Downlink" position receiving signals from the airborne transponder on a Kenwood TS820 equipped with a Hamtronics 435 MHz Converter.

Elliot Oseas, WA6KGN, operated the "uplink" position using a Kenwood TS700A.

Dick Handlen, WA6SLB, maintained ground-to-air and air-to-ground communications position operating via a 220 MHz repeater on Mount Wilson, WR6AJI.

Don, John, Elliot, and Dick are members of the Hughes Aircraft Co. ARC. Tom McInnes, WB6ZEB, president of the HAC Club and Sam Weise, W6LXR, set up and maintained ground station antenna facilities.

John Swancara, WA6LOD, and John Gerlack, K6BRD, also participated in the operations.

Sandra Bostrom (PHD), Don's XYL, provided a most delightful buffet. Also, in the wings was Nancy Reymann, Skip's XYL.

About 10 calls were heard in the narrow passband of the Mode J transponder. On the ground tests at the airport Skip (W6PAJ) reported an 18 KHz bandwidth for the prototype transponder (Not the AMSAT-OSCAR D onboard flight unit--Editor) Calls heard were (in addition to the Ground Station operators):

WB6GSP (SSB)	W6TCQ (SSB)
K68GX (FM)	W6XT (CW)
W6PAJ (SSB)	N6IC (SSB)
W6LO (SSB)	

There were no interfering signals and no reports of signals being interfered with.

K6PGX

(Continued from Page 3)

For those wishing to compute their own orbit predictions, the following reference orbit data is available.

Year 1977, Day 339; S/N ascending node equatorial crossing time

1 hour, 41 minutes 45.3 seconds; longitude 213.096 degrees West.

-- Data supplied by W6XN via 20 meter AMSAT Net
on December 4, 1977

MODIFYING THE HENRY RADIO MODEL MR-2 TWO-METER FM RECEIVER FOR AMSAT-OSCAR 7 MODE B SATELLITE RECEPTION

BY PERRY KLEIN, W3PK

We have found that the Model MR-2 twelve-channel, two-meter FM receiver sold and distributed by Henry Radio easily can be modified to receive downlink CW and SSB signals from the AMSAT-OSCAR 7 Mode B satellite transponder (145.925 - 145.975 MHz). The modifications can be accomplished without removing the unit from its case. All components are readily accessible by removing the top cover containing the speaker (remove two Phillips-head screws). Suggested modifications are:

1. Add the following receiving crystals to receive the OSCAR 7 Mode B downlink passband. If you begin with one or two crystals, pick them around the center of the passband.

<u>To Receive</u>	<u>Use Crystal At</u>	<u>To Receive</u>	<u>Use Crystal At</u>
145.930 MHz	45.07667 MHz	145.960 MHz	45.08667 MHz
145.940 MHz	45.08000 MHz	145.970 MHz	45.09000 MHz
145.950 MHz	45.08333 MHz	145.980 MHz	45.09333 MHz

2. To add incremental tuning capability, clip the leads of capacitor C7 and replace it with a subminiature 5-25pf trimmer capacitor. One end of this trimmer capacitor can be soldered to IF can T1, and the other end to the top lead of R6, both accessible without removing the unit from its case. Drill a small hole in the top cover next to the speaker to provide external access to the capacitor for tuning.

3. Connect a 1-5pf subminiature trimmer capacitor from the base of transistor Q4 to the base of Q8. This will provide a BFO by producing controlled feedback oscillation across the 455 kHz IF stages. One end of the trimmer capacitor can be soldered to the top lead of R7, and the other end to the top lead of R16 (R16 is the 47K resistor mis-labelled "R15" in the parts placement diagram. It is located between Q8 and T7.) Drill a small hole in the top cover next to the speaker to provide external access to the trimmer capacitor to adjust BFO injection level. Again, R7 and R16 are accessible without removing the unit from its case.

4. Peak RF transformers T1, T2 and T5, and local oscillator transformers T8 and T4 for maximum signal using incoming satellite signals as a signal source.

It was found that no modification of the detector circuit was required, nor was it necessary to modify the limiter stages, since the satellite signals are generally not strong enough to cause limiting and quieting in the receiver. Signals are strong enough, however, that the unit's 20" wire antenna is sufficient for satisfactory reception of AMSAT-OSCAR 7 Mode B.

STARQUEST

"STARQUEST", a small group of interested Radio and Astronomical Amateurs, was founded two years ago in the San Francisco Bay Area by Nick Marshall, W6OLO, one of the founders (also first Technical Director) of Project OSCAR and father of Project MOONRAY. Nick is also a Charter Member of AMSAT. The new "STARQUEST" group, now numbering about 25 members is open to anyone interested in the Search for Extraterrestrial Intelligence. There are no dues or fees of any kind -- only a sincere interest in the subject is required. The "STARQUEST" group is currently in the process of assembling an Amateur "EARTH STATION" that will be receiving on the 1400 to 1700 MHz band with a large aperture (50 to 150 ft) spherical or parabolic dish (still to be scrounged). A monthly "STARQUEST" Net operates on the AMSAT net frequency of 14.280 MHz on the first Sunday of each month and immediately follows the closing of the AMSAT Net at 1900 Z. Those interested in obtaining further detailed information about "STARQUEST" activities, send a self-addressed stamped envelope to W6OLO (O.K. in any Call Book) for a "STARQUEST BULLETIN".

AMSAT GRATEFULLY ACKNOWLEDGES DONATIONS OF \$100 OR MORE FROM THE FOLLOWING
NEW LIFE MEMBERS

LM-638 David L. Timmerman, WB9CER	LM-697 Wes Miller, HB9A0Y/W9LAB
LM-639 Patrick Hamptaux (Belgium)	LM-698 DeForest O. Romain, W2IEV
	LM-699 Anthony E. Meyer, (New Jersey)
LM-656 Roland Gugerli, HB9BDZ	LM-700 John O. Thayer, K3DD5
LM-657 Alan E. Gearing, WB4ETC	LM-701 Tess Hardie, VE3HIR
LM-658 H.J. Stephens, VK5ZZ	LM-702 Dr. Ernesto Diez, EA3A00
LM-659 Olliver Pearce, Z55JY	LM-703 Edgar M. Cameron, W6DC
LM-660 R.H. Robinson, W4ZR	LM-704 James R.W. Marsh, WD8DWN
LM-661 Ted Dames, W2KUW	LM-705 P.D. King, ZL1PK
LM-662 Ross W. Forbes, WB6BFJ	LM-706 Kenneth Newman, N2CQ
LM-663 Dyrck John DeWitt, (Alaska)	LM-707 Roland M. Fennimore, WB4JAI
LM-664 James C. Grubs, W8GRT	LM-708 C. A. Munro, VE1AJZ/VE1SAT
LM-665 John E. Stanis, W6TKI/W7TKI	LM-709 Charles O. Webb, WB5UER
LM-666 Dr. A. C. Key, WB4WRM	LM-710 Mickey A. Driver, WB5IXN
LM-667 Allan D. McFarland, WD4GBJ	LM-711 Edwin P. Westbrook, W3EW
LM-668 Roy C. Dolley, WB6VGA	LM-712 Kenneth V. Hardman, W2DV
LM-669 Nels E. Knutzen, W0PEC	LM-713 Delbert L. Vaughn, K6RTR
LM-670 Henry E. Gamache, KH6AIN	LM-714 Colin W. Richards, 9M2CR
LM-671 Arturo Henriquez H., YN1H	LM-715 James P. Weathers, W6QQ
LM-672 Cory Hamasaki, KH6FHN	LM-716 Comps Daw, VK5EF
LM-673 Arthur C. Chomacke, K9PUR	LM-717 Richard G. Trebel, WB5JGU
LM-674 B.W. Bugden, G8MCS	LM-718 Kenneth C. Bird, (Canada)
LM-675 Craig V. Bledsoe, K4TXK	LM-719 Joseph D. Novak, K4OVK
LM-676 R.A. Simpson, N2NN	LM-720 George B. Blackwell (Canada)
LM-677 Joseph G. Preski, K1ERF	LM-721 Craig R. Gernaey, WA6EQZ
LM-678 W. Lee Mack, K7PY	LM-722 J. R. Bullington, N4HX
LM-679 William H. Brodie, Jr., K3TGY	LM-723 Richard G. Moore, K1GKR
LM-680 Donald Hoge, K9VWX	LM-724 W.L. "Bill" Morris, VE3DEV
LM-681 William D. Johnston, Jr., N5KR	LM-725 Richard J. Buchan, W0TJF
LM-682 E. George Elliott, VE3LI	LM-726 Jose Israel, YV5GDX
LM-683 Alan R. Salisbury, N6KX	LM-727 Jonathan T. Morey, W2HXF
LM-684 J. Henry Felton, Jr., WA4HXZ	LM-728 B. Lindholm (Dalsbruk-Finland)
LM-685 Ann Willert, DJ0IX	LM-729 Garfield A. Anderson, K0GA
LM-686 Victor Ruebhausen, W6WNK	LM-730 Dr. D. L. Filmer, WB9QPG
LM-687 Richard L. Siff, WA4BUE	LM-731 George Vernardakis, SV1AB
LM-688 Ralph E. Tyrrell, W1TF/W1TFS	LM-732 Joseph S. Barnocky, W3LRN
LM-689 Herman C. Knief, W2YTO	LM-733 R. Forslund, VE3EDZ
LM-690 Alex Chanes L., CE3ABZ	LM-734 Lyle E. Clark, W7RDR
LM-691 Leonard F. Marino, W3IOH	LM-735 Duane Snyder, K9PIG
LM-692 Donald D. Goff (New York)	LM-736 Hector T. Gonzales, YV5BQJ
LM-693 Connie A. Smith, WB5WID	LM-737 W.R. Adey, K6UI
LM-694 William J. Smith, WB5WIC	LM-738 Robert E. Dryden, W40JK
LM-695 Paul Petrowski, W9KMI	LM-739 Joseph Westheimer, WB6KUC
LM-696 Stephen A. Townes, WB4ILW	LM-740 David A. Kattan, HR26K/K5RBE

1978 AMSAT-OSCAR 7 ORBITAL DATA CALENDAR

Skip Reymann, W6PAJ, has published an improved AMSAT-OSCAR orbital data calendar containing all orbits for 1978 for AMSAT-OSCAR 7. Designed so that it may be hung on the wall, the calendar includes information on the operating schedules and frequencies for the spacecraft, and also the telemetry decoding equations. Also included is step-by-step information on how to determine times of passage of the satellite.

The orbital calendar is available post-paid for \$5.00 U.S. funds or 30 IRC's (\$3.00 to AMSAT members, and free on request to AMSAT Life Members). Overseas orders will be airmailed. Orders and payments should be made in U.S. currency to:

Skip Reymann, W6PAJ
P. O. Box 374
San Dimas, California 91773 USA

Orders may also be charged to VISA or Master Charge. (Be sure to provide your account number, expiration date and other information on your charge card.)

Important -- To speed up handling of your order, please include a gummed, self-addressed label.

Proceeds from the sales of the Orbital Calendar benefit AMSAT.

AMSAT OPERATING AWARDS

Each year for the past three years, AMSAT has introduced a new satellite operating award. Awards currently available are the AMSAT Oscar Award (AOA), the Oscar Sexagesimal Award (OSA), and the newly created Oscar Century Award (OSA). The objective, in all cases, is to establish and confirm two-way QSOs with different stations via any amateur radio satellite. The basic counting QSO-elements are as follows: US states, Canadian call-areas, and other countries. The AOA, OSA, and OCA certificates are available for 20, 60, and 100 QSO-elements, respectively. In addition, endorsements are available for the AOA in 10 QSO-element intervals ranging from 30 to 90. (To date only three OCAs have been issued, recipients being G3IOR, WA2CBB, and W2RS.) Alternately, the AOA can be obtained by establishing and confirming two-way amateur radio satellite QSOs with 6 Australian call-areas and two other countries; or with 8 different Japanese call-areas and four other countries; or any other requirements as specified by the AMSAT Board of Directors. Generally QSL cards or other written confirmation of contacts must be submitted to verify the QSO-elements claimed. However, in lieu of such QSL cards, applicants may submit a list of contacts confirmed by the awards manager of their national amateur radio society or AMSAT affiliate organization. Appropriate QSO credit may be claimed for AMSAT issued awards and endorsements. All contacts must be made from the same QTH, i.e., within an area of 40 km (25 miles) from any given location. The awards are free to all AMSAT members, so be sure to specify your membership number upon application. However, sufficient postage must be supplied for the return of QSL cards. A service charge of one US-dollar (\$1) is required for the AOA, \$2 for the OSA, and \$5 for the OCA, for all non-AMSAT members.

All awards are available from AMSAT Awards Manager, PO Box 27, Washington, DC, 20044, USA; alternately the AOA and 10 element endorsements may be obtained from any of the following area award managers: DC9DX, F6BEG, G8KLO, OZ1WL, SP9DH, VK5HI, and ZL2GX.

Earl Skelton, N3ES
AMSAT Awards Manager

AREA COORDINATOR UPDATE

The following changes should be made to your Area Coordinator lists:

USA

South Carolina	delete K4DBV/N4EL
West Virginia	Clark L. Stewart, W8TN, 104 Henrietta Street, Ravenswood, West Virginia, 26164 (304) 273-4680
Iowa	Ralph Wallio, WØRPK, RR4, Indianola, Iowa, 50125 (515) 961-6406
New Mexico	delete WB5QPG
California	Norm Chalfin, K6PGX, Box 463, Pasadena, CA 91102

OVERSEAS

AMSAT-DEUTSCHLAND	(New address) Alexander Schoening, DC7AS, Ludolfingerweg 52, 1000 Berlin 28 (030) 401-4411
GIBRALTAR	Jimmy Bruzon, ZB2BL, 27 Flat Bastion Road, Gibraltar, phone 70170
HUNGARY	Andras Gschwindt, HA5WH, Radio Club of the Technical University of Budapest (HG5BME), H-1111, Budapest, Goldmann Gyorgy, Ter. 3
SWITZERLAND	Ted Vogel, HB9OP, 23 Pont Ceard, CH-1290 Versoix/Geneva

AMSAT-OSCAR QSL BUREAU (New Manager and gra)

Ross W. Forbes, WB6GFJ
 Post Office Box 1
 Los Altos, California 94022
 (916) 673-7677 Weekdays
 (916) 742-0572 Weekends/Evenings

is serving as AMSAT QSL Manager for OSCAR cards in the United States. U.S. users should send several #10 (business-size) SASE's with your call sign, in large letters, in the upper left hand corner. One call sign per SASE, please. Each SASE should have only one ounce of first class postage affixed, and will be mailed when full. Outgoing DX OSCAR QSL's will be forwarded at a rate of 6¢ per card or 20 cards for \$1.00. Domestic OSCAR QSL's will be sorted and processed through the AMSAT-OSCAR QSL Bureau at no charge. Domestic OSCAR QSL's can be sent in bulk. For more detailed information concerning the AMSAT-OSCAR QSL Bureau, drop a note to the above address with an SASE enclosed for your reply.

Your new AMSAT QSL Bureau Manager is active on OSCAR 7, Mode A, and has many years of QSL experience. Besides being an active QSL collector himself, Ross has been QSL Manager for a number of DX stations, and was the W6 QSL Bureau Manager, for the NCDXC, from 1969 until 1972. Ross Forbes is a member of the ARRL, the Northern California Contest Club, and is a life member of AMSAT.

MEMBERSHIP RENEWAL NOTICE

AMSAT Newsletter
 Dec. 1977

Please complete form and mail to AMSAT as soon as possible.

Name _____ Call _____ License Class _____ ARRL Member? _____
 State _____ ZIP or
 Street _____ City _____ (Country) _____ Postal
 Code _____

Membership Number _____ or, check here if you are applying for new membership _____.

Please indicate here if you have made one or more contacts on AMSAT-OSCAR 6 or 7 Mode A ____; AMSAT-OSCAR 7 Mode B _____. Would you be willing to accept an AMSAT assignment in a technical area? _____ an administrative area? _____

Individual membership dues for the calendar year 1978.....\$10.00
 (Approx. half the dues are for subscription to the quarterly "AMSAT Newsletter")

Member Society dues for the next calendar year (\$20.00).....\$ _____

Life Membership (donation of \$100 or more).....\$ _____

An AMSAT-OSCAR Satellite Pin Provided to New Life Members

A-O-7 Orbit Card for 1978 (@ \$3 each).....\$ _____
 (Provided free to Life Members on request)

Life Member Society (donation of \$200 or more).....\$ _____

Contribution toward AMSAT Phase III Satellite (Solar cells may be sponsored at \$10.00 per cell, battery cells at \$200).....\$ _____

Other _____ \$ _____

TOTAL AMOUNT ENCLOSED

(Please make your check or money order payable to "AMSAT" in U.S. funds*)

\$ _____

*NOTE: Members outside the U.S. may send their AMSAT dues in local currency to their national organization: AMSAT-DL, AMSAT-France, AMSAT-Italiana, JAMSAT, AMSAT-Mexico, AMSAT-Nederland, AMSAT-UK, or NZART. Swiss dues can be sent to HB9OP. Members in countries with currency restrictions may send IRC's (@ 5½ IRC's per \$1.00).

All mailings to members outside of North America, including the "AMSAT Newsletter," will be sent via airmail. Life members in the U.S. receive their Newsletters by First Class Mail.

YOU... AND AMSAT PHASE III



An exciting new era in amateur radio is about to begin...the era of AMSAT PHASE III OSCAR satellites.

The AMSAT PHASE III satellite program promises a continuing demonstration that amateur radio is at the forefront of modern technology. PHASE III satellites will routinely provide reliable communications over paths of up to 11,000 miles (17,600 km) for 17 hours each day. You can think of them as a resource equivalent to a new band.

The cost of these PHASE III satellites is a projected \$250,000. Commercial satellites of similar performance would cost nearly \$10,000,000.

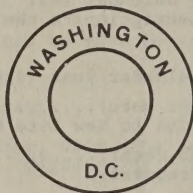
Your help is needed to put these PHASE III OSCAR satellites in orbit.

Your valued, tax-deductible contribution can be as small as one of the 5000+ solar cells needed. A handsome certificate will acknowledge the numbered cells you sponsor for \$10 each. Larger components of the satellites may also be sponsored with contribution acknowledgements ranging to a plaque carrying your name aboard the satellites. Call or write us for the opportunities available.

Your membership in AMSAT is important to the satellite program, and will give AMSAT a stronger voice in regulatory matters concerned with satellites. At \$10 per year or \$100 for life, you will be making a most significant contribution to the satellite program and the future of amateur radio. You will also receive the quarterly AMSAT newsletter.

AMSAT
P.O. Box 27
Washington, D.C. 20044

RETURN POSTAGE GUARANTEED



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